Data Mining Configurator

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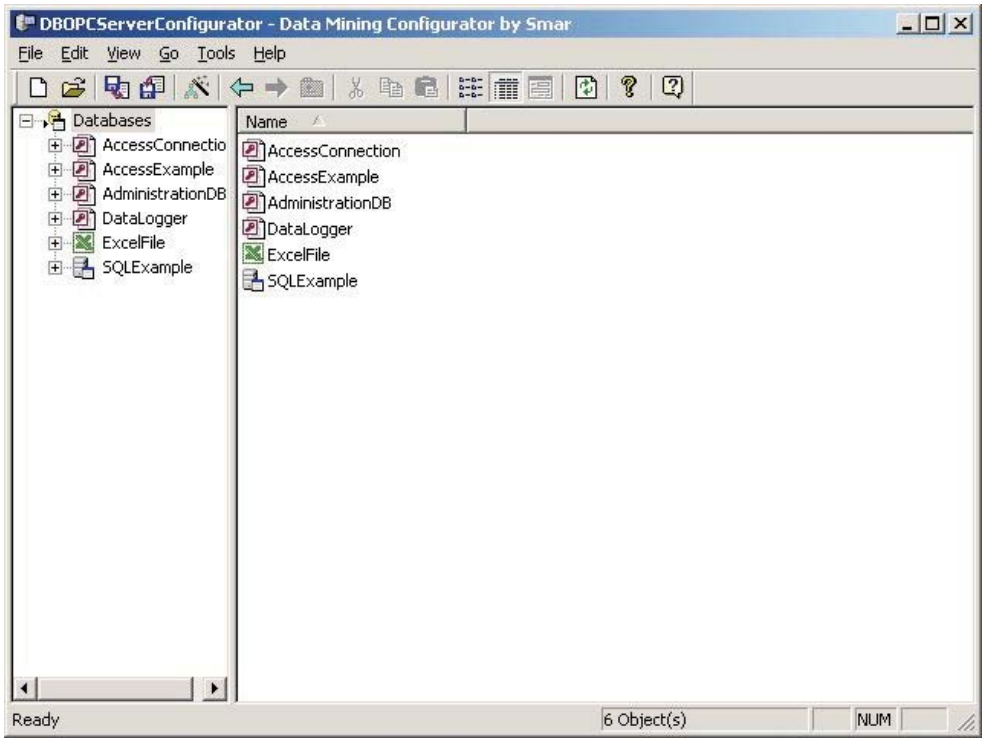
DATA MINING
CONFIGURATOR
VERSION 8

FOUNDATION™

Data Mining Configurator



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DATA MINING CONFIGURATOR

Introduction

The basic purpose of PROCESSVIEW data mining is to visualize data from various data sources, such as a Microsoft Access database, in a customizable, user-friendly display format that enables users to interact with and manipulate the data. The Data Mining Configurator establishes connections with data sources that can be mined from PROCESSVIEW applications, such as GraphWorX, where users can visualize data. In general, the Data Mining Configurator enables you to:

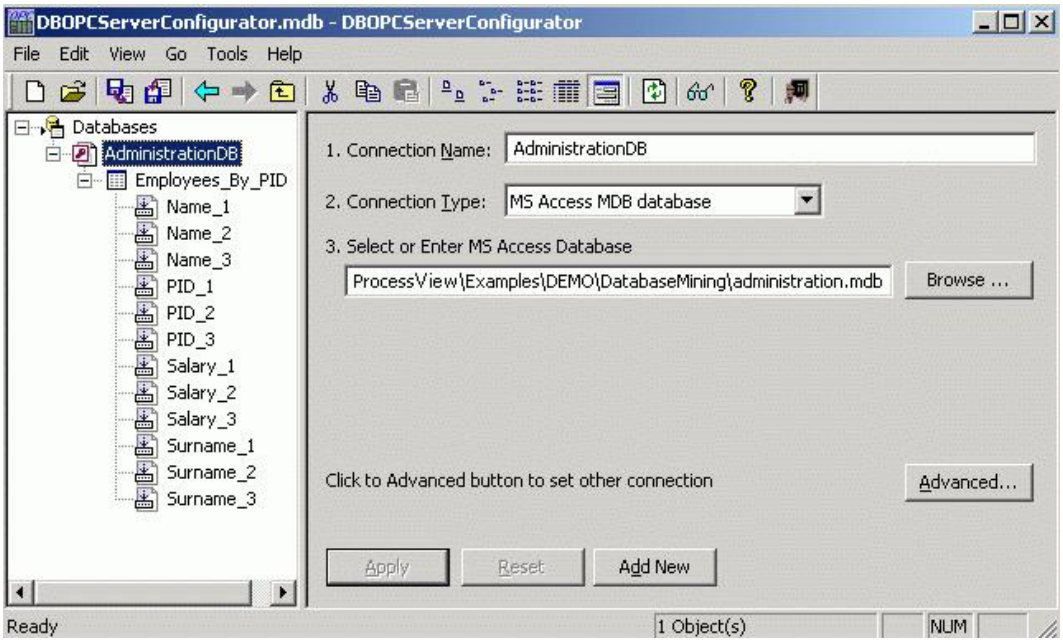
- Connect to databases (i.e. where to get the data).
- Select data sets to mine within the connected databases (i.e. which group of data within the connected database).
- Specify data items to monitor within the chosen data sets (i.e. which values to read from the selected group of data).

Once you have configured your database connections using the Data Mining Configurator, you can configure a GraphWorX display in order to visualize the data. In GraphWorX, the Unified Data Browser enables you to create process points using data items from your data mining configuration database. Thus, the data mining configuration database serves as a medium through which data can be channeled from multiple data sources (e.g. Microsoft Access, Microsoft SQL Server, Microsoft Excel, Oracle, and ODBC data sources) to a visualization medium (i.e. GraphWorX) where you can view or manipulate the data.
Key features of data mining include:

- Brings database access to any OPC client.
- Supports many data sources, including Microsoft Access, Microsoft SQL Server, Microsoft Excel, MSDE, and Oracle.
- Easy-to use dataset support includes database table access (single field read or write, column read or write, row read or write, and two-dimensional array read or write) as well as simple SQL commands.
- Data manipulators enable access to database stored procedures and execution of complex SQL commands.
- Database Connection Wizard.
- Database object browser.
- Support for aliasing (one data tag can access multiple database fields).
- Data Mining (grid) ActiveX control.
- Data Mining Configurator.
- Integration of data-mining configuration into Unified Data Browser.

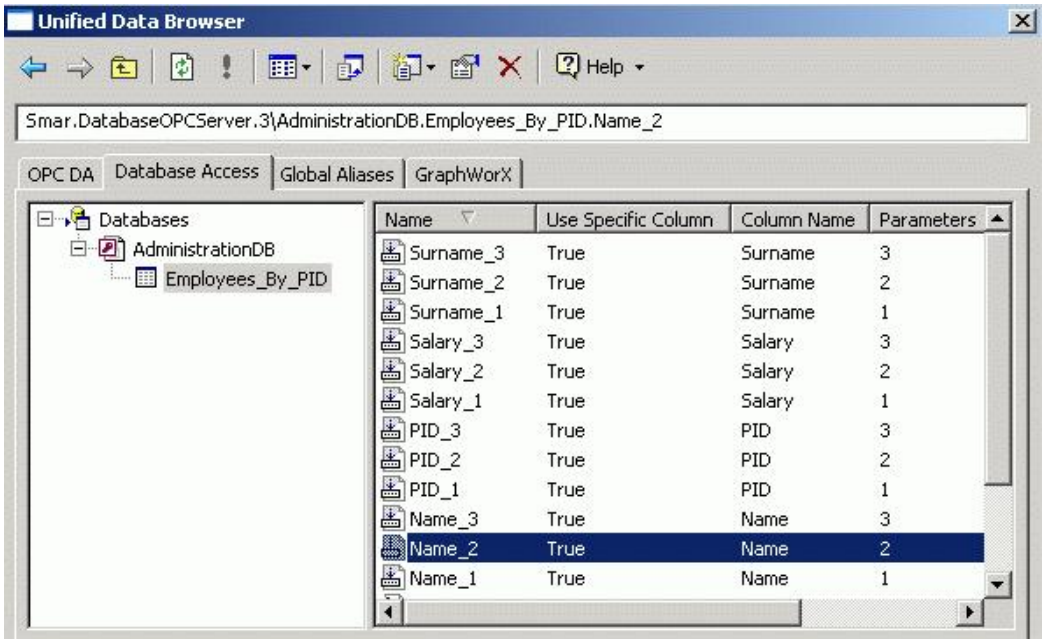
Configuring the Data Mining OPC Server

The data-mining OPC server can be configured using two configuration tools: The first is the stand-alone **Data Mining Configurator,** shown in the figure below. This document describes how to use the Data Mining Configurator.



Stand-Alone Data Mining Configurator

The second tool is embedded in the **Unified Data Browser** on the **Database Access** tab, as shown in the figure below. This tab is available together with OPC Data Access browser. It was designed for ease of use to allow users to make on-the-fly modifications in the server address space. This second tool supports a subset of features available in the Data Mining Configurator application. For more information, please see the Unified Data Browser Help documentation.



Unified Data Browser: Database Access Tab

NOTE
Both data-mining configuration tools are capable of configuring Data Mining OPC Servers on the local machine only.

When configuring data mining, first you should decide what type of action you want to perform with databases; there are two basic options:

- Read the data periodically and display them in an OPC client (e.g. in GraphWorX)
- Manipulate database data upon user request.

The first option is represented by **Data Sources;** the second option by **Data Manipulators.** Both of these objects need to specify a **Database Connection.** For instruction on how to create each of these objects in the configuration database, please see the sections below.

Data Mining Configuration Quick Start

Data mining configuration involves the following basic steps:

1. Start the Data Mining Configurator.
2. Connect to a database (i.e. where to get the data).
3. Select a data set or data manipulator to mine within the connected database (i.e. which group of data within the connected database).
4. Specify which data items to monitor within the chosen data set (i.e. which values to read from the selected group of data.
5. Create a GraphWorX display that connects to data items in your data mining configuration database.
6. Visualize and manipulate the data in the GraphWorX display in runtime.

The steps listed above are described throughout this document. The PROCESSVIEW installation provides a **Data Mining Demo** configuration that will help you get started with your data mining configurations. The following section will guide you through the demo.

NOTE
The Data Mining Configurator provides a **Data Mining Wizard** that helps you create and configure your data source connections. You can also configure your data mining settings in the **Database Access** tab in the Unified Data Browser. For more information, please see the Unified Data Browser help documentation.

Data Mining Configuration Demo

The PROCESSVIEW installation provides a **Data Mining Demo** configuration. To view the demo files, go to the **C:\Program Files\Smar ProcessView\Examples\Database Mining Examples** directory in the PROCESSVIEW installation. This directory contains the following files:

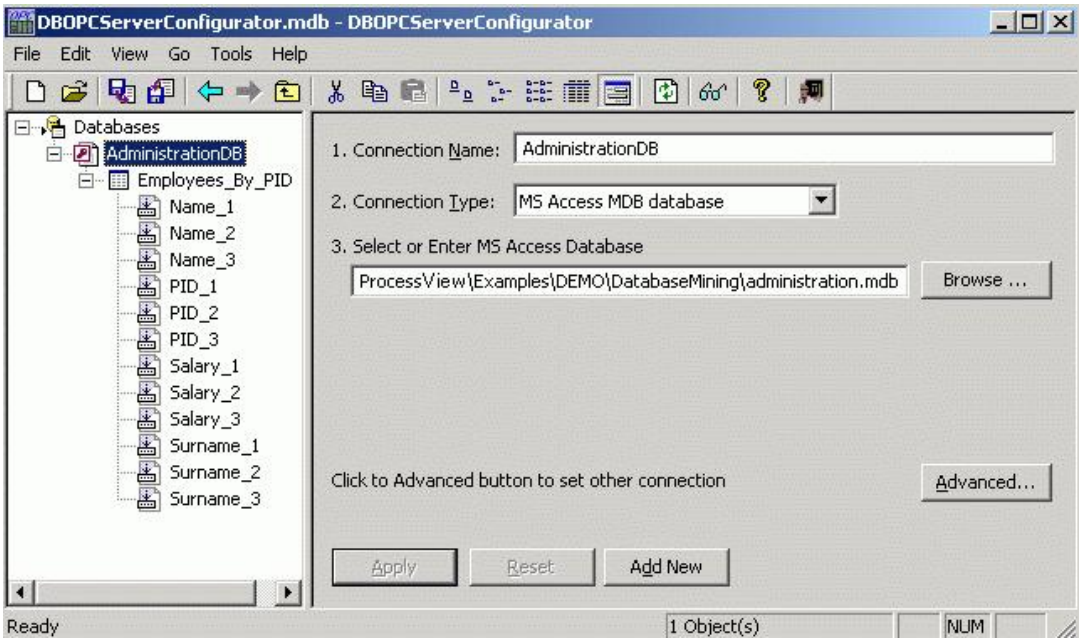
- **DBOPCServerConfigurator.mdb:** This Microsoft Access file is the default active data mining configuration database.
- **administration.mdb:** This Microsoft Access file is the demo database connection.
- **DBOPC.gdf:** This is a GraphWorX display that allows you to view the data sources and data items specified in the demo database connection.

To view the **DBOPCServerConfigurator.mdb** demo configuration database:

1. Open the Data Mining Configurator from the Windows **Start** menu by selecting **Programs > Smar ProcessView > Tools > Data Mining Configurator.**
2. This opens the **DBOPCServerConfigurator.mdb** database in the Configurator, as shown in the figure below. The main tree control of the Configurator is called **Databases.** Under this tree control, you can see the following items:

- The demo database connection, called **AdministrationDB,** which connects to the **administration.mdb** Microsoft Access database.
- A demo data source, called **Employees_By_PID.**
- Several data items (e.g. **Name_1, Name_2, Name_3, PID_1, PID_2,** etc.)

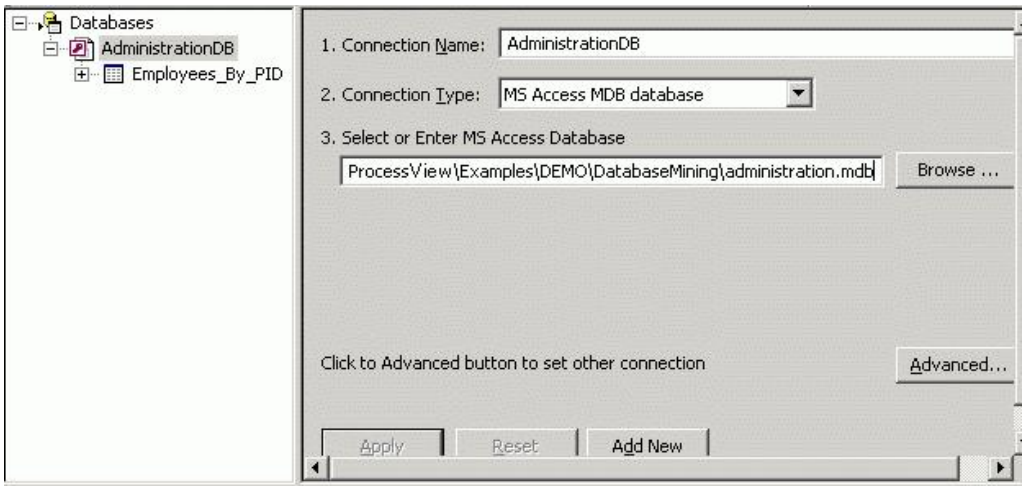
These demo items are described in greater detail in the sections below.



Data Mining Configuration Demo

Demo Database Connection

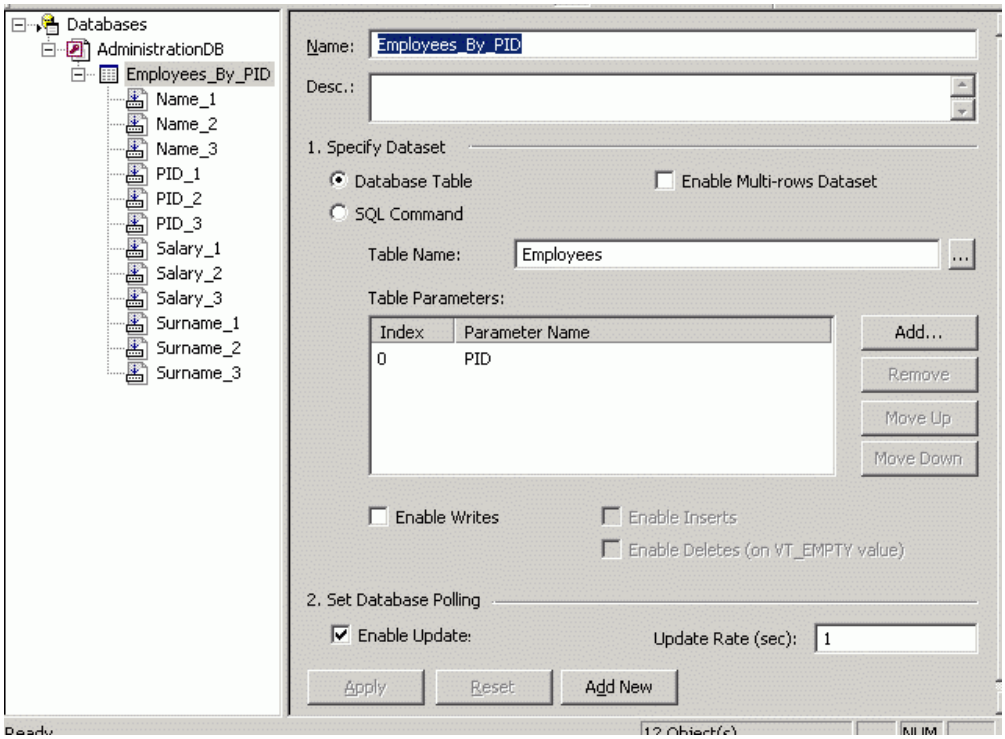
The Data Mining Configurator default configuration database provides a demo database connection called **AdministrationDB,** as shown in the figure below. The example configuration shows a connection to a Microsoft Access database called **administration.mdb,** which is located in the **C:\Program Files\SMAR\PROCESSVIEW\Examples\Database Mining Examples** directory in the PROCESSVIEW installation.



Database Connection Demo

Demo Data Source

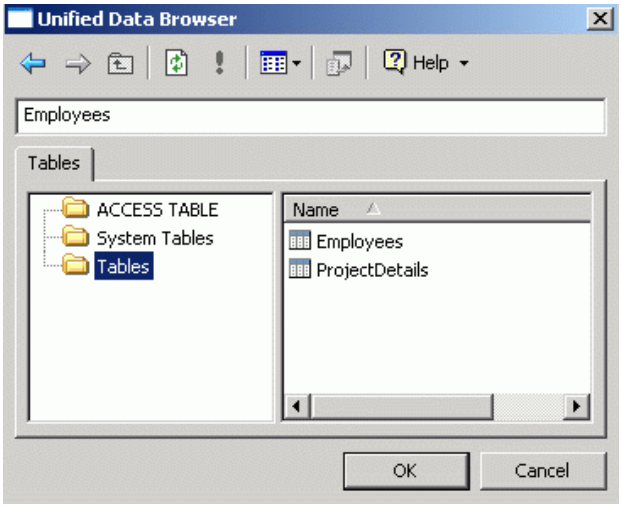
The Data Mining Configurator demo database connection, called **AdministrationDB,** contains a data source called **Employees_By_PID,** as shown in the figure below. This example configuration shows a data source connection for the **administration.mdb** database.



Data Source Demo

As you can see in the **Employees_By_PID** data source configuration above, the data set specifies a table in the **administration.mdb** (Access) database called **Employees.** To view the tables in the database:

1. Click on the **…** button next to the **Table Name** field, as shown in the figure above.
2. This opens the **Unified Data Browser,** which displays a list of tables in the database, as shown in the figure below. As you can see, the database contains two tables: **Employees** and **ProjectDetails.** In this demo data source, the **Employees** table already has been selected.



Employees Table in Unified Data Browser

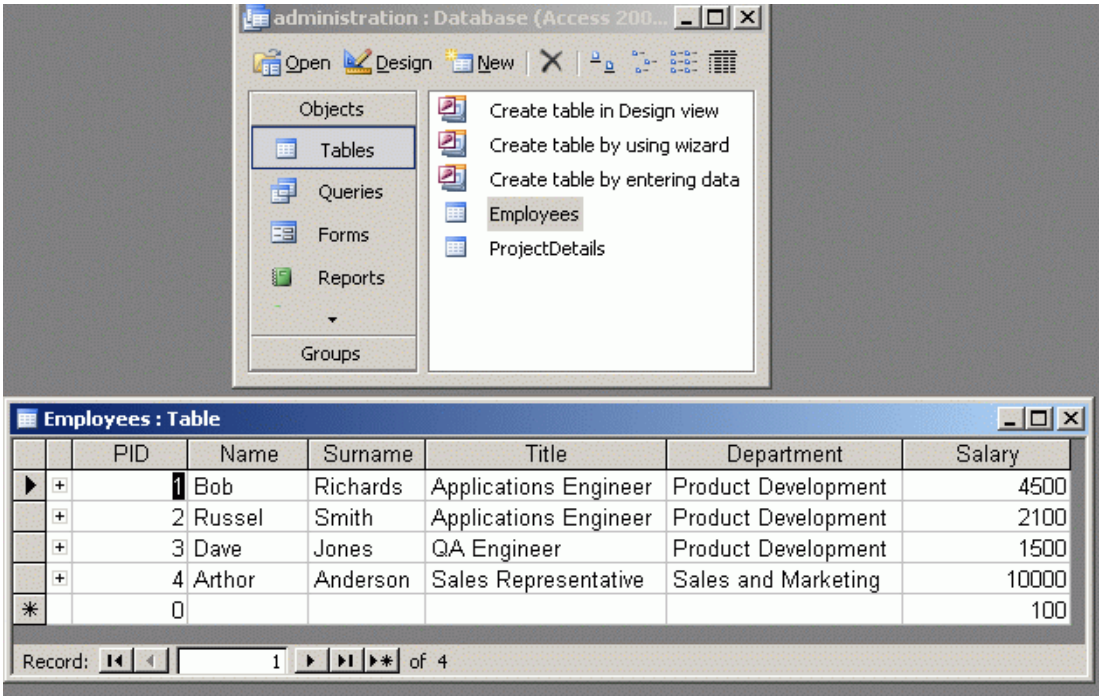
3. To view the same the database tables in Microsoft Access, start Microsoft Access (must be installed through Microsoft Office) and open the administration.mdb file in the C:\Program **Files\SMAR\PROCESSVIEW-\Examples\Database Mining Examples** directory in the

PROCESSVIEW installation. The **Employees** database table in the database contains several columns and rows of data about four different employees, as shown in the figure below:

- Bob
- Russel
- Dave
- Arthor

The columns list the personal data for each employee:

- **PID:** Employee's identification number
- **Name:** Employee's first name
- **Surname:** Employee's last name
- **Title:** Employee's job position
- **Department:** Company department in which the employee works
- **Salary:** Employee's salary



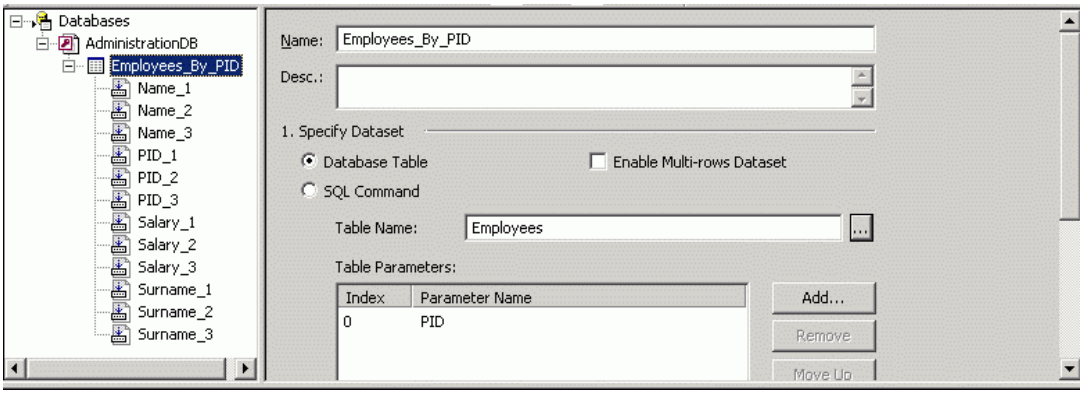
Employees Table in Administration Database

Demo Data Items

As shown in the figure below, the **Employees_By_PID** data source configuration contains several data items:

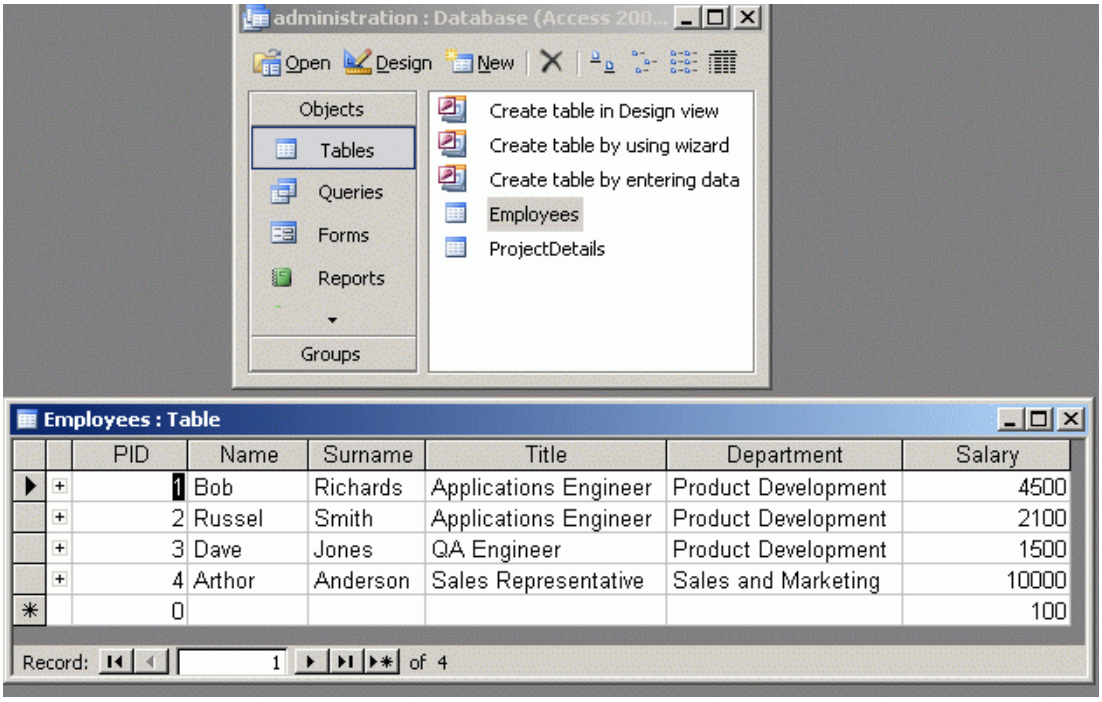
- Name_1
- Name_2
- Name_3
- PID_1
- PID_2
- PID_3
- Salary_1
- Salary_2
- Salary_3
- Surname_1

- Surname_2
- Surname_3



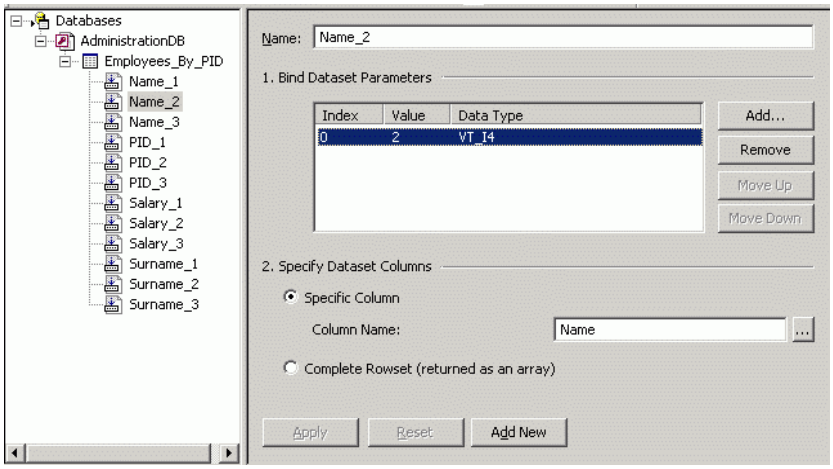
Data Items in Employees Table

The data items correspond to the information in the **Employees** database table in the Administration database. For example, the itemID **AdministrationDB.Employees_By_PID.Name_2** has the value **Russel,** because **Russel** is the second name listed in the database table, as shown in the figure below.



Employees Table in Administration Database

How do you determine which value to display for each itemID? This is defined in the data item properties. For example, click on the **Name_2** data item in the tree control under the **Employees_By_PID** to view the data item properties, as shown in the figure below.

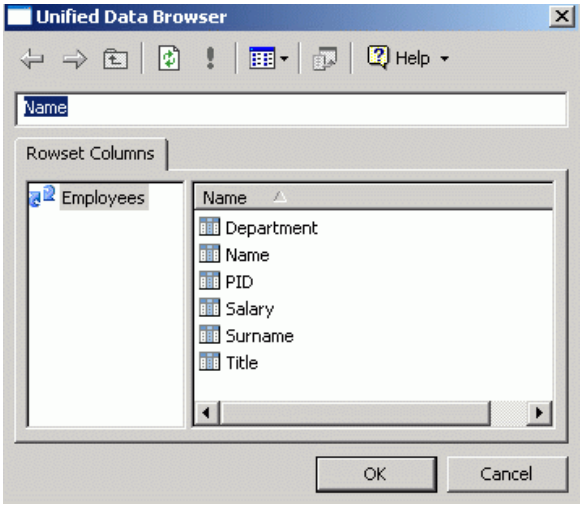


Data Item Demo

To select a column name from the database table, choose **Specific Column** and then click the **…** button next to the **Column Name** field as shown in the figure above. This opens the **Unified Data Browser,** which displays a list of columns in the **Employees** database table, as shown in the figure below. The columns list the personal data for each employee:

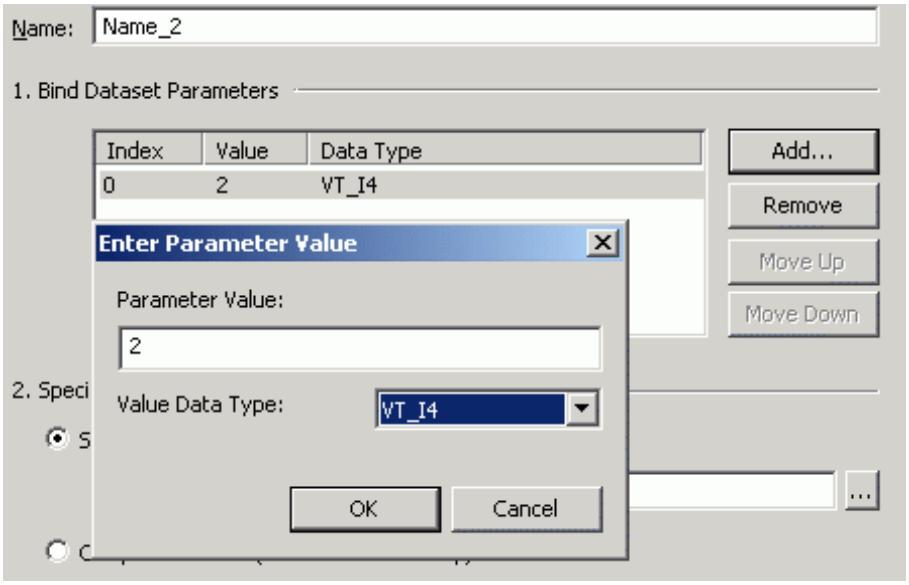
- **PID:** Employee's identification number
- **Name:** Employee's first name
- **Surname:** Employee's last name
- **Title:** Employee's job position
- **Department:** Company department in which the employee works
- **Salary:** Employee's salary

In this example, the **Name** column is already selected for the **Name_2** data item.



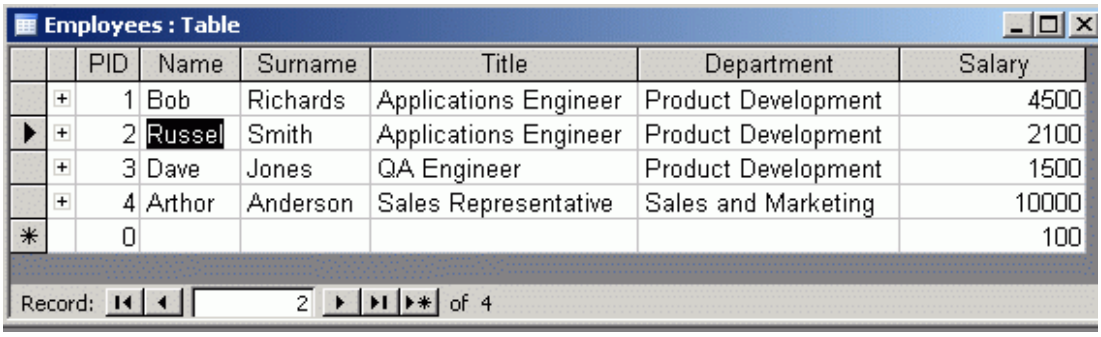
Names Column in Unified Browser

Once you have selected a table, you need to specify a data set parameter (i.e. a specific value that you want to read from the database table). Click the Add button to enter a Parameter Value, as shown in the figure below.



Specifying Data Set Parameters

The Parameter Value corresponds to the record number in the database table. For data item Name_2, the Parameter Value is "2," as shown in the figure above. As you can see in the figure below, in the Name column, record number "2" corresponds to the second value in the column. Thus, the value for record number "2" is Russel, which is highlighted in the figure below. Thus, the Parameter Value for data item Name_2 will be resolved as "Russel," as shown in the figure below.



Record Number in Database Table

GraphWorX Data-Visualization Demo

Now that you have seen how the demo database connection, demo data source, and demo data items are configured in the Data Mining Configurator, the next step is to visualize the data in GraphWorX. The Data Mining Demo provides an example GraphWorX display that shows how to configure your data mining connections so you can view data coming from the database.

1. Go to the **C:\Program Files\Smar ProcessView\Examples\Database Mining Examples** directory in the PROCESSVIEW installation and open the **DBOPC.gdf** file.

2. The display opens in GraphWorX configuration mode, as shown in the figure below. The display contains two different examples of data mining visualization: static and dynamic. A **static** display simply displays the data values from the connected database. A **dynamic** display allows you to manipulate data values from the connected database.

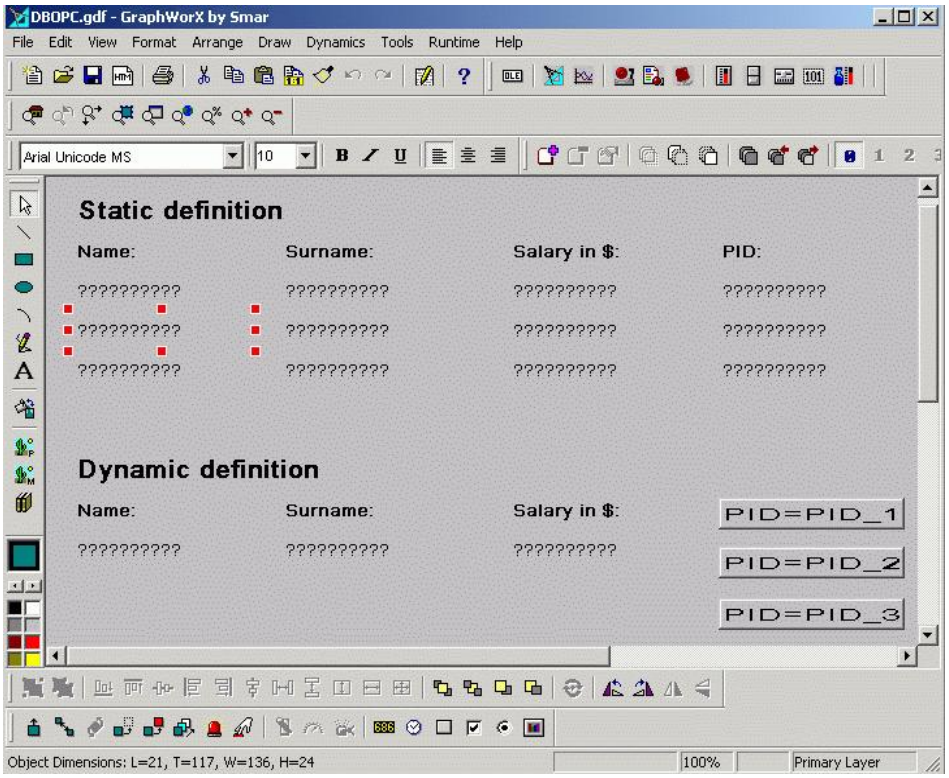
The table in the **static definition** section contains some column names from the **Employees** database table, as shown in the figure below:

- **Name:** Employee's first name
- **Surname:** Employee's last name
- **Salary:** Employee's salary

- **PID:** Employee's identification number

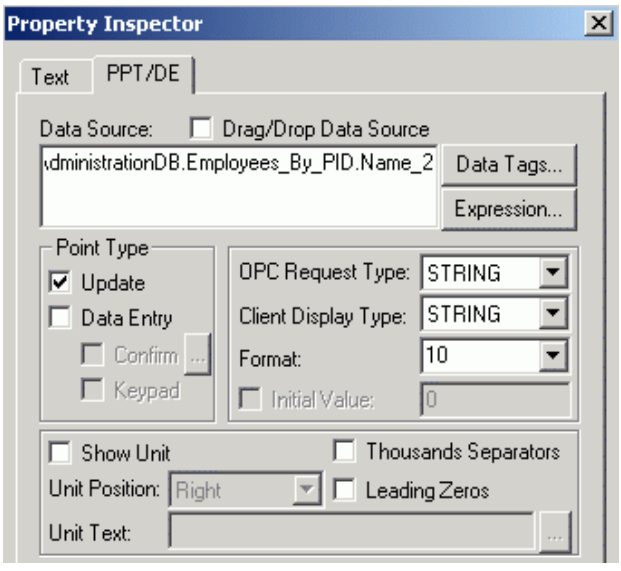
Each column contains process points that correspond to data items (e.g. **Name_1, Name_2, Name_3, PID_1, PID_2,** etc.) in the **Employees_By_PID** data source from the demo data mining configuration. A process point must be configured for each data item. We will continue to look at the **Name_2** data item as an example:

3. Under the **Name** column in the GraphWorX display, double-click the second process point under the **Name** column, as shown in the figure below.



Data Mining Demo in GraphWorX: Configuration Mode

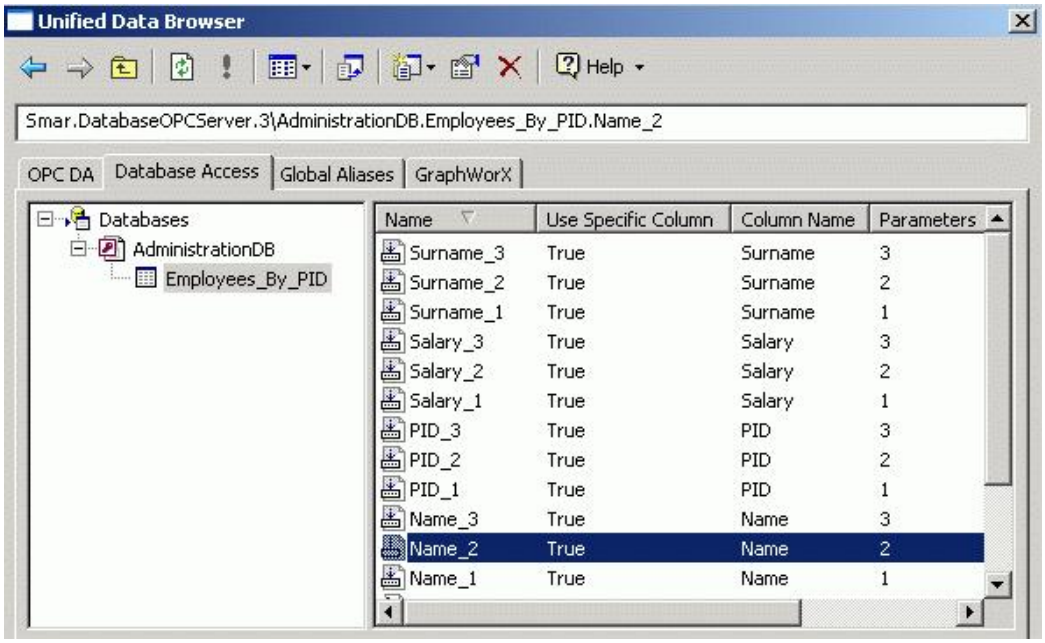
4. This opens the **Property Inspector** for the data item. Click on the **PPT/DE** tab, as shown in the figure below. As you can see, the **AdministrationDB.Employees_By_PID.Name_2** item ID has already been specified in the **Data Source** field.



Property Inspector for Name_2 Data Item

5. Click on the **Data Tags** button to open the Unified Data Browser. The Unified Data Browser opens to the **Database Access** tab, as shown in the figure below. You can see that the browser tree control is similar to the tree control in the Data Mining Configurator; you can choose from configured data items from the **Employees_By_PID** data source connection. The **Name_2** item ID has already been selected. Notice that each **ItemID** (e.g. **SMAR.DatabaseOPCServer.3\AdministrationDB.Employees_By_PID.Name_2**) contains the following information:

- Server name (e.g. **SMAR.DatabaseOPCServer.3**)
- Database connection name (e.g. **AdministrationDB**)
- Data source name (e.g. **Employees_By_PID**)
- Data item name (e.g. **Name_2**)

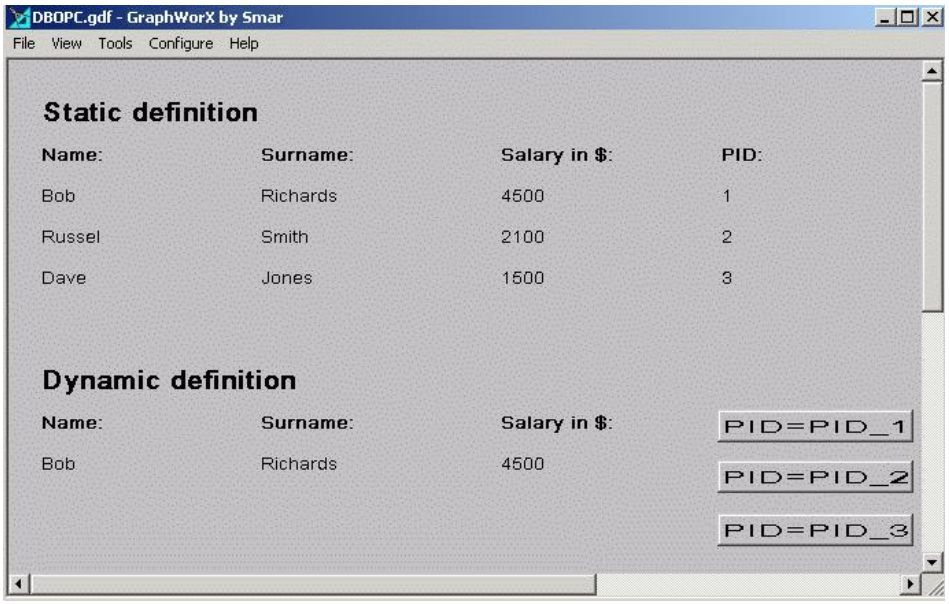


Data Item Specified in Unified Browser

6. Close out of the Unified data Browser and the Property Inspector dialog box.

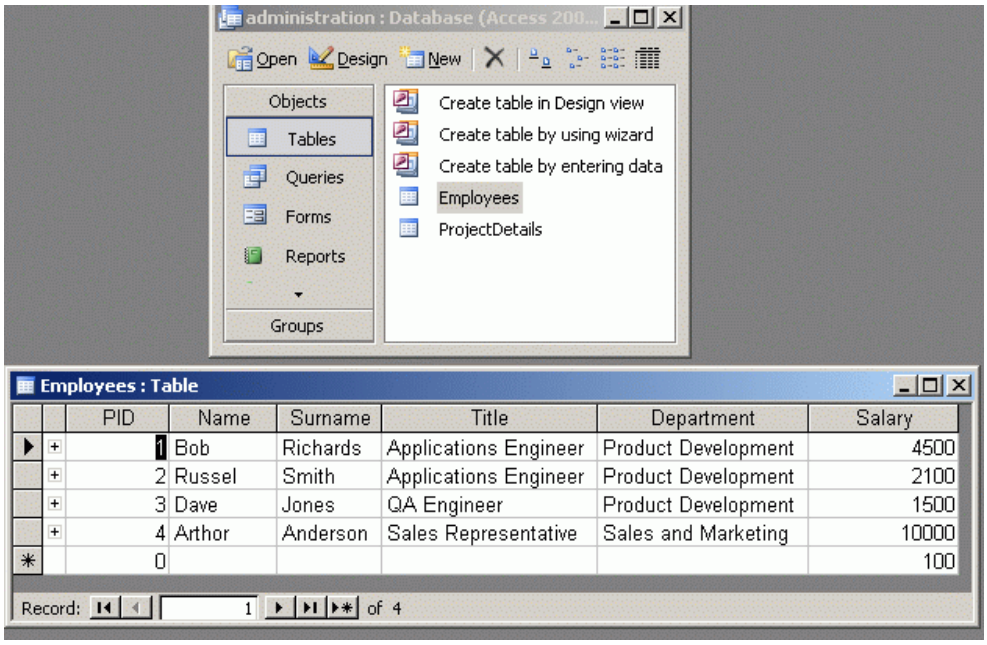
7. Enter the GraphWorX display into runtime mode. You can see the data coming from the **Employee** database table, as shown in the figure below. Notice that the **Parameter Value** for data item **Name_2** is resolved as "Russel" in the visualization display.

Note: The **Static definition** section simply displays the values from the **Employee** database table for the configured data items, but the data cannot be manipulated. The **Dynamic definition** section also displays values from the **Employee** database table, but in this case only one row of data is displayed at a time, and you change the currently viewed row by clicking the three PID buttons, as shown in the figure below. The dynamic configuration uses local aliases and global aliases, which enable you to switch between rows during runtime mode.



Data Mining Demo in GraphWorX: Runtime Mode

8. The items displayed in GraphWorX correspond to the information in the **Employees** database table in the Administration database. For example, the itemID **AdministrationDB.Employees_By_PID.Name_2** has the value **Russel,** because **Russel** is the second name listed in the database table, as shown in the figure below.



Employees Table in Administration Database

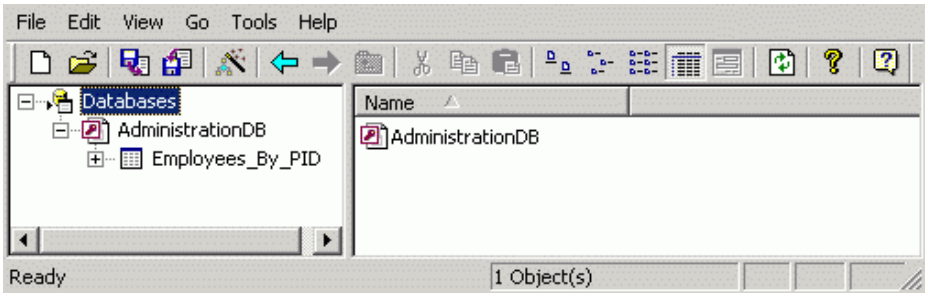
Starting the Data Mining Configurator

To start the Data Mining Configurator:

1. From the Windows **Start** menu, select **Programs > Smar ProcessView > Tools > Data Mining Configurator.**

2. This opens the Configurator, as shown in the figure below. The screen consists of a split window with a tree control view in the left-hand pane and a configuration view in the right-hand pane. The Configurator provides a standard format for the configuration database, as well as a

sample (default) configuration project. The Configurator also includes a toolbar and menus with many command functions.

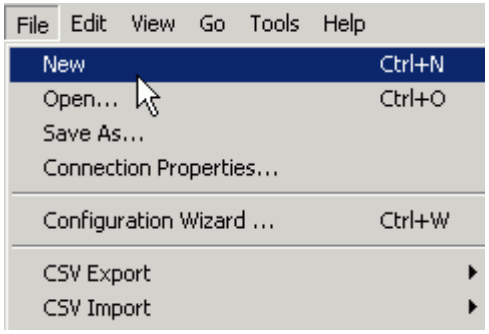


Configurator Screen

Creating a New Configuration Database

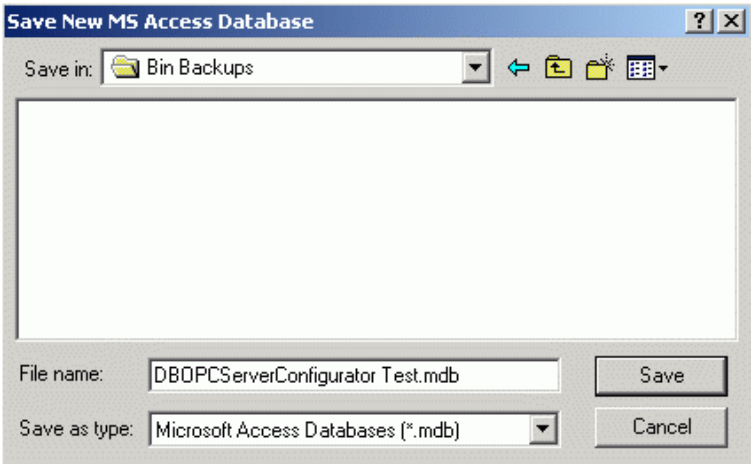
To create a new configuration database in the Configurator:

1. Select **New** from the **File** menu, as shown in the figure below.



Creating a Configuration Database

2. In the **Save New Database** dialog box, select the database type from the **Save As Type** drop-down list, as shown in the figure below. Browse for the target directory, give the file a name, and then click the **Save** button.



Saving the New Configuration Database

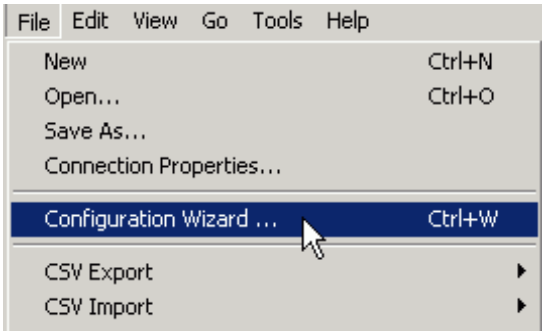
Data Mining Configuration Wizard

The Data Mining Configurator provides a **Data Mining Configuration Wizard** that helps you create and configure your database connections.

NOTE
You can also configure your data mining settings in the Database Access tab in the Unified Data Browser. For more information, please see the Unified Data Browser help documentation.

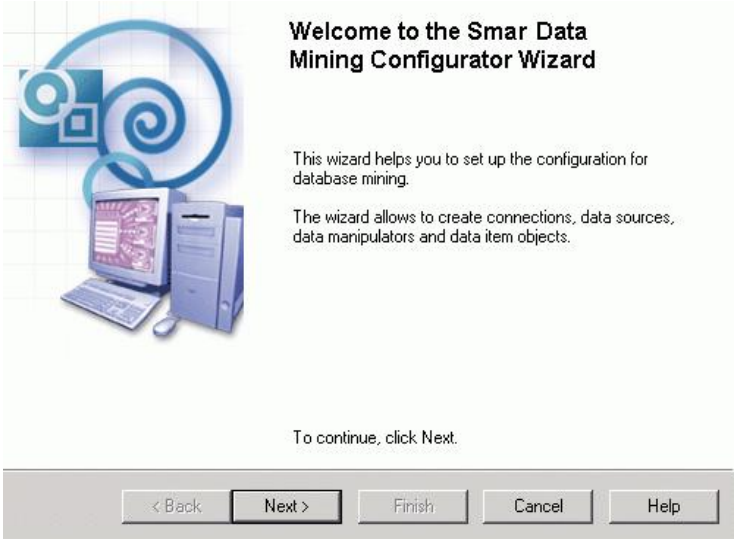
To run the **Data Mining Configuration Wizard:**

1. Select **Configuration Wizard** from the **File** menu, as shown in the figure below.



Starting the Data-Mining Configuration Wizard

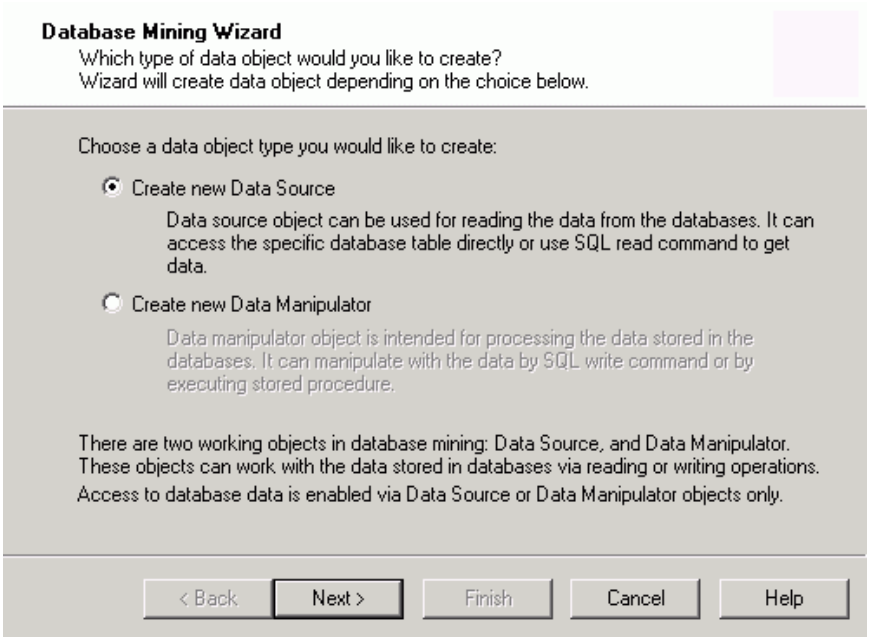
2. The introduction screen for the Data Mining Wizard appears. Click the Next button to continue.


Welcome to the Smar Data Mining Configurator Wizard
This wizard helps you to set up the configuration for database mining.
The wizard allows to create connections, data sources, data manipulators and data item objects.
To continue, click Next.
< Back
Next >
Finish
Cancel
Help

Data-Mining Wizard: Welcome Screen

3. You have two options: Create a New Data Source or Create a New Data Manipulator, as shown in the figure below. A data source can be use to read data from a database. It can access a specific database table directly or use a SQL read command to get data. A data manipulator, which is intended for processing data stored in a connected database, manipulates data using a SQL write command or by executing a stored procedure. Choose an option, and then click the Next button to continue.

An example wizard configuration is described in the section below.

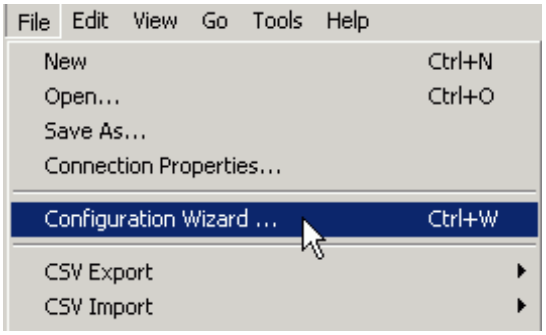

Database Mining Wizard
Which type of data object would you like to create?
Wizard will create data object depending on the choice below.
Choose a data object type you would like to create:
Create new Data Source
Data source object can be used for reading the data from the databases. It can access the specific database table directly or use SQL read command to get data.
Create new Data Manipulator
Data manipulator object is intended for processing the data stored in the databases. It can manipulate with the data by SQL write command or by executing stored procedure.
There are two working objects in database mining: Data Source, and Data Manipulator. These objects can work with the data stored in databases via reading or writing operations.
Access to database data is enabled via Data Source or Data Manipulator objects only.
< Back
Next >
Finish
Cancel
Help

Data-Mining Wizard: Data Object Options

Example Configuration Using Data Mining Configuration Wizard

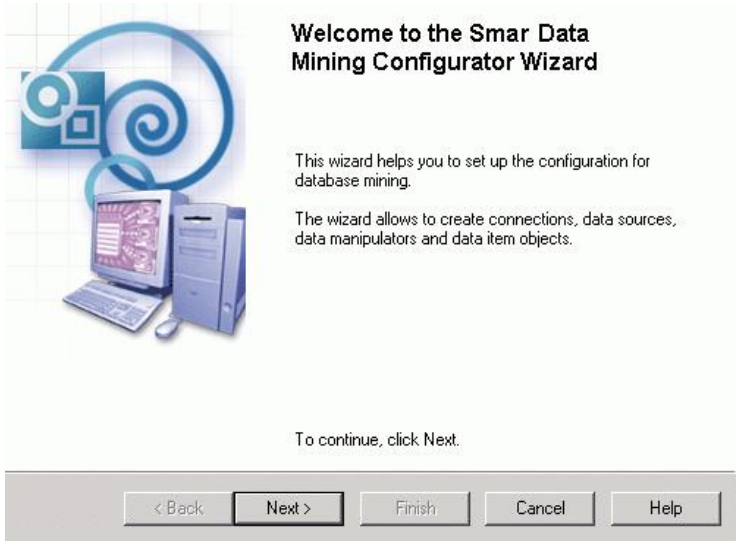
The following example walks you through the steps in creating a simple Microsoft Access database connection using the Data Mining Configuration Wizard.
To run the **Data Mining Wizard:**

1. Select **Configuration Wizard** from the **File** menu, as shown in the figure below.



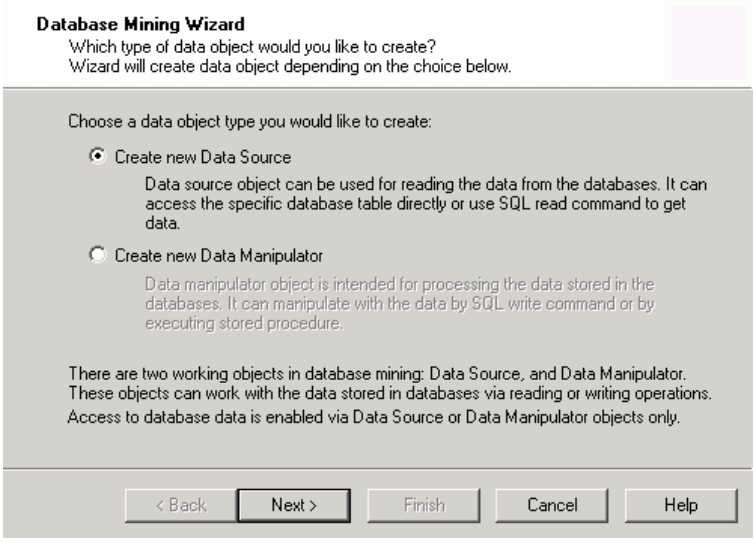
Starting the Data-Mining Configuration Wizard

2. The introduction screen for the Data Mining Wizard appears. Click the **Next** button to continue.


Welcome to the Smar Data Mining Configurator Wizard
This wizard helps you to set up the configuration for database mining.
The wizard allows to create connections, data sources, data manipulators and data item objects.
To continue, click Next.
< Back
Next >
Finish
Cancel
Help

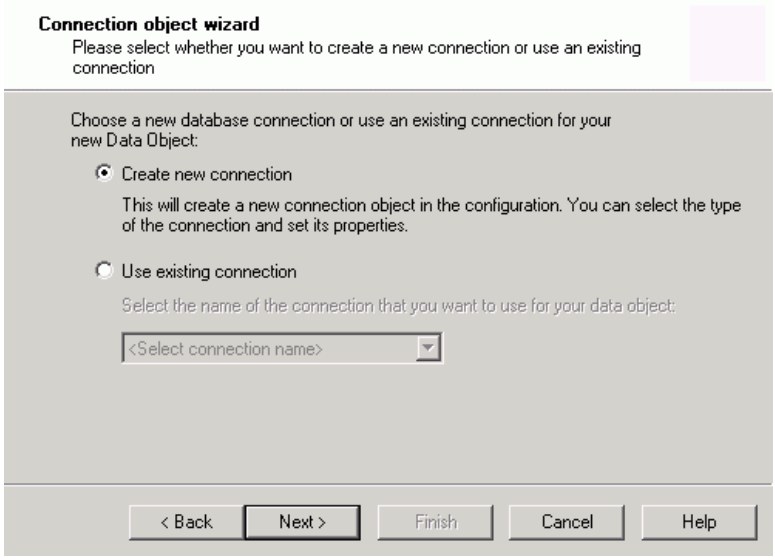
Data-Mining Wizard: Welcome Screen

3. You have two options: **Create a New Data Source** or **Create a New Data Manipulator,** as shown in the figure below. A **data source** can be use to read data from a database. It can access a specific database table directly or use a SQL *read* command to get data. A **data manipulator**, which is intended for processing data stored in a connected database, manipulates data using a SQL *write* command or by executing a stored procedure. Choose an option, and then click the **Next** button to continue.


Database Mining Wizard
Which type of data object would you like to create?
Wizard will create data object depending on the choice below.
Choose a data object type you would like to create:
Create new Data Source
Data source object can be used for reading the data from the databases. It can access the specific database table directly or use SQL read command to get data.
Create new Data Manipulator
Data manipulator object is intended for processing the data stored in the databases. It can manipulate with the data by SQL write command or by executing stored procedure.
There are two working objects in database mining: Data Source, and Data Manipulator. These objects can work with the data stored in databases via reading or writing operations. Access to database data is enabled via Data Source or Data Manipulator objects only.
< Back
Next >
Finish
Cancel
Help

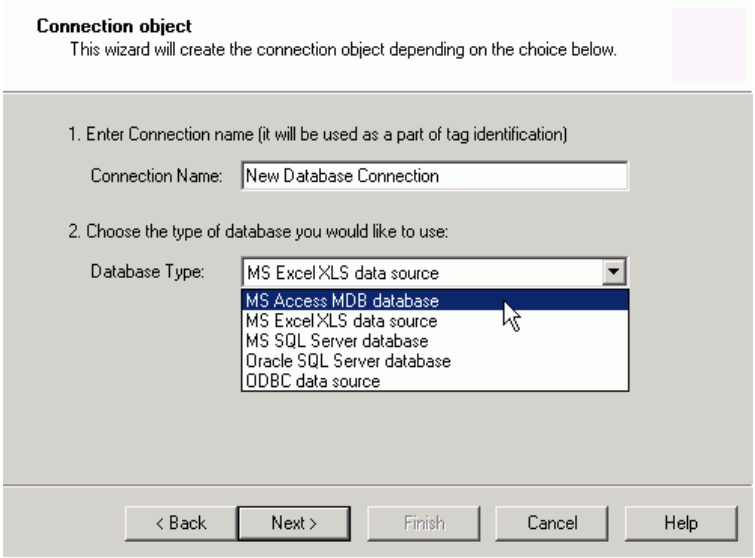
Data-Mining Wizard: Data Object Options

4. The next step in the Data Mining Wizard is to connect to a database (i.e. where to get the data). You have two options for database connection: **Create a New Connection** or **Use an Existing Connection,** as shown in the figure below. Choose an option, and then click the **Next** button to continue.


Connection object wizard
Please select whether you want to create a new connection or use an existing connection
Choose a new database connection or use an existing connection for your new Data Object:
Create new connection
This will create a new connection object in the configuration. You can select the type of the connection and set its properties.
Use existing connection
Select the name of the connection that you want to use for your data object:
<Select connection name>
< Back
Next >
Finish
Cancel
Help

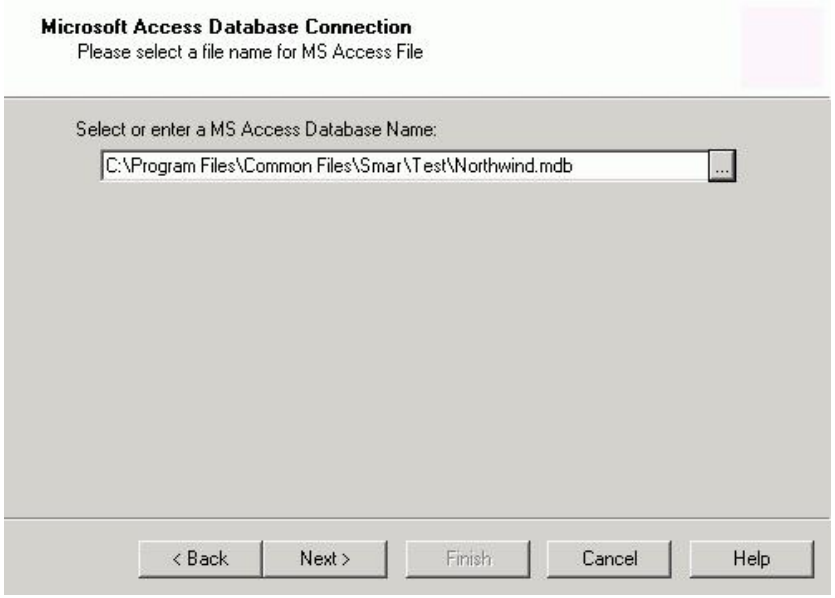
Data-Mining Wizard: Database Connection Options

5. In the Connection Name field, enter a name for the new database connection. Then select the type of database (e.g. Microsoft Access, Microsoft SQL Server, Microsoft Excel, or Oracle) you would like to use from the drop-down list, as shown in the figure below. Click the Next button to continue.


Connection object
This wizard will create the connection object depending on the choice below.
1. Enter Connection name (it will be used as a part of tag identification)
Connection Name:
New Database Connection
2. Choose the type of database you would like to use:
Database Type:
MS Excel XLS data source
MS Access MDB database
MS Excel XLS data source
MS SQL Server database
Oracle SQL Server database
ODBC data source
< Back
Next >
Finish
Cancel
Help

Data-Mining Wizard: Creating New Database Connection

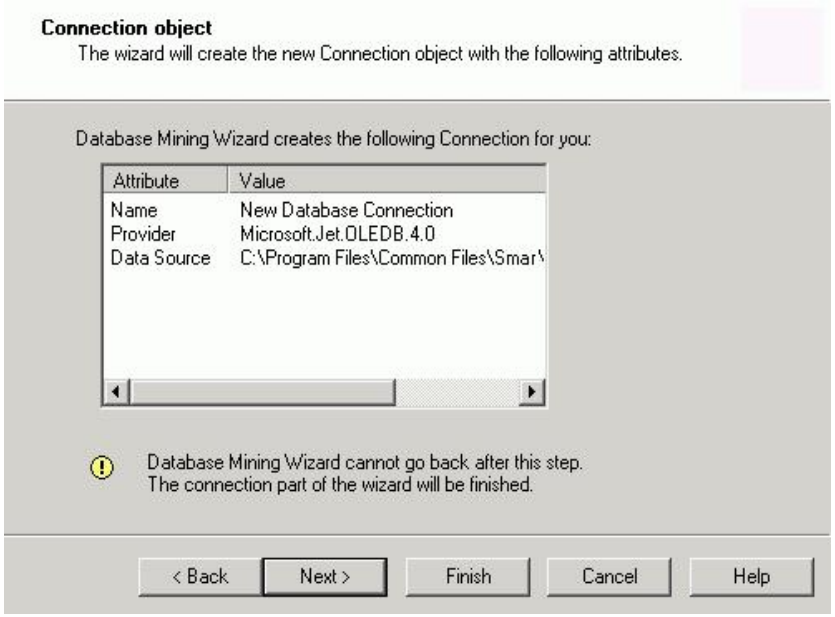
6. Specify the database, as shown in the figure below (which shows a Microsoft Access database connection). The example below uses the Northwind.mdb database, which is installed with Microsoft Access. Click the Next button to continue.



Data-Mining Wizard: Specifying Database

7. The Wizard displays the database connection information that you specified, as shown in the figure below. Click the Next button to complete the database connection.

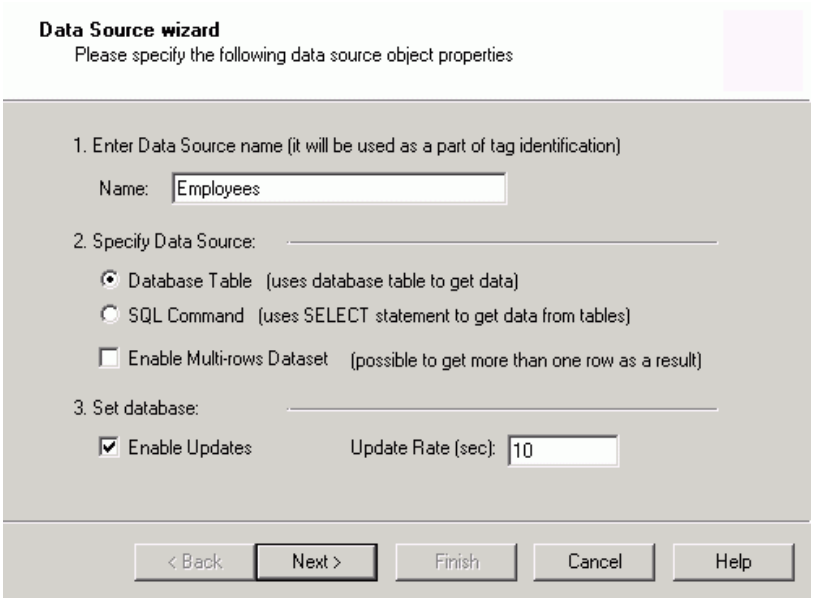
NOTE
You cannot go back after this step.



Data-Mining Wizard: Confirming Database Connection

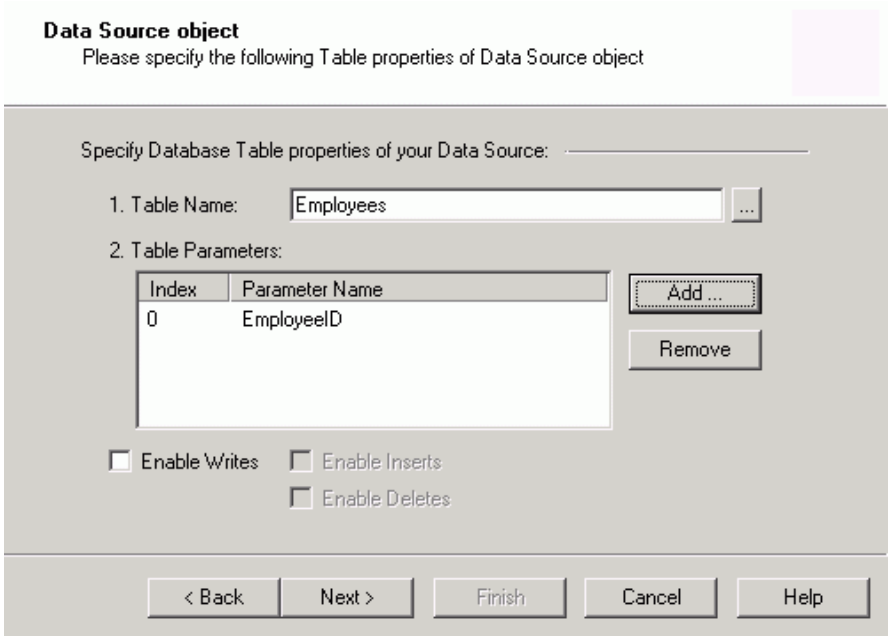
8. Now you will configure the data source properties, as shown in the figure below. Select Database Table or SQL Command. In the example below, Database Table is selected. Click the Next button.

NOTE
You cannot go back after this step.


Data Source wizard
Please specify the following data source object properties
1. Enter Data Source name (it will be used as a part of tag identification)
Name: Employees
2. Specify Data Source:
Database Table (uses database table to get data)
SQL Command (uses SELECT statement to get data from tables)
Enable Multi-rows Dataset (possible to get more than one row as a result)
3. Set database:
Enable Updates
Update Rate (sec): 10
< Back
Next >
Finish
Cancel
Help

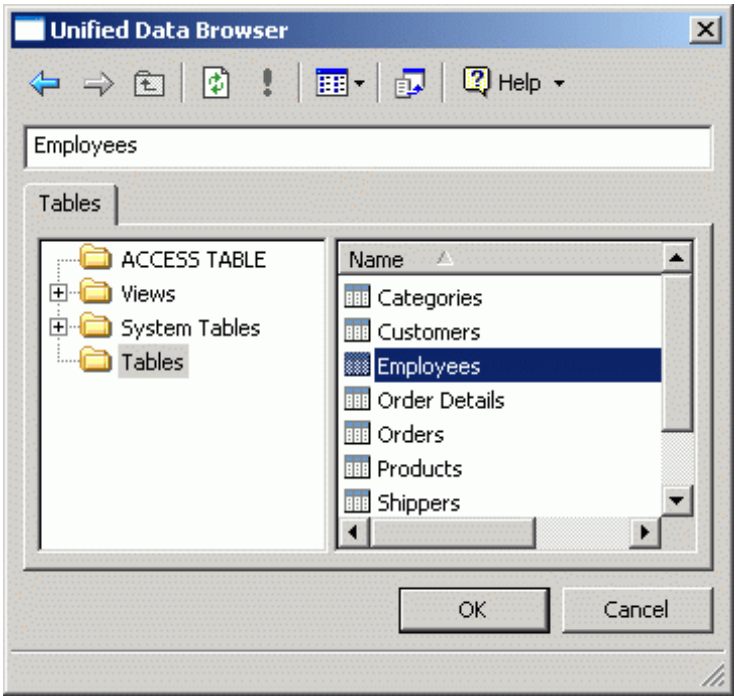
Data-Mining Wizard: Data Source Properties

9. In the Table Name field, click the … button, as shown in the figure below.



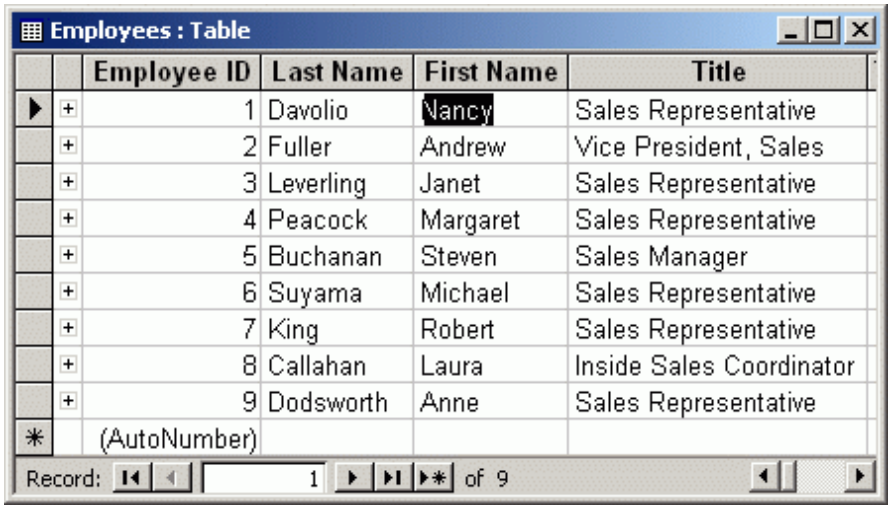
Data-Mining Wizard: Selecting a Database Table

10. This opens the Unified Data Browser, which lists all the tables in the database, as shown in the figure below. Select a table (e.g. Employees), and then click OK.



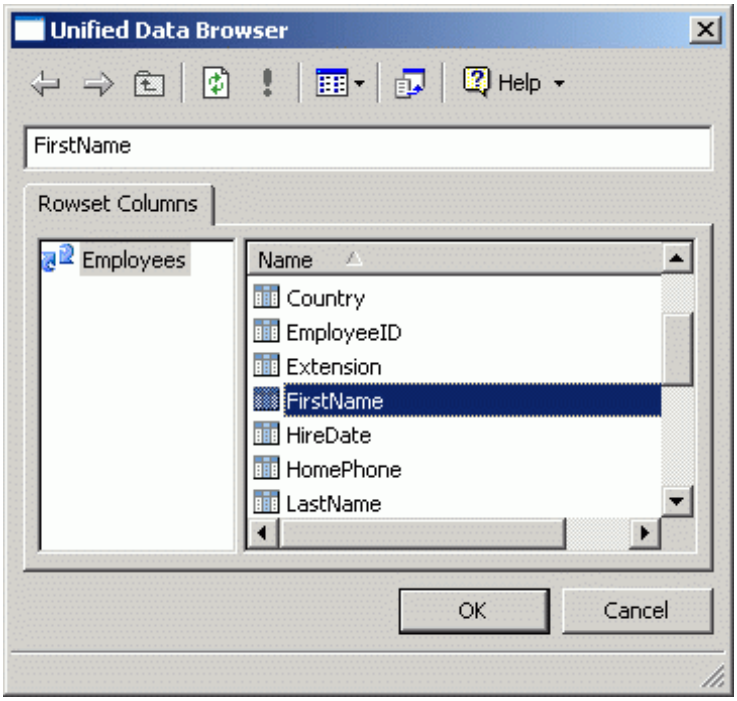
Selecting a Database Table

11. If you view the database table in Microsoft Access, you can see the column names (e.g. Employee ID, Last Name, First Name, etc.) in the Employees table, as shown in the figure below. The next step is to select a column name from which to read the data. For example, we will use the First Name column, which lists several employee names (e.g. Nancy, Andrew, Janet, etc.).



Employees Table in Northwind Database

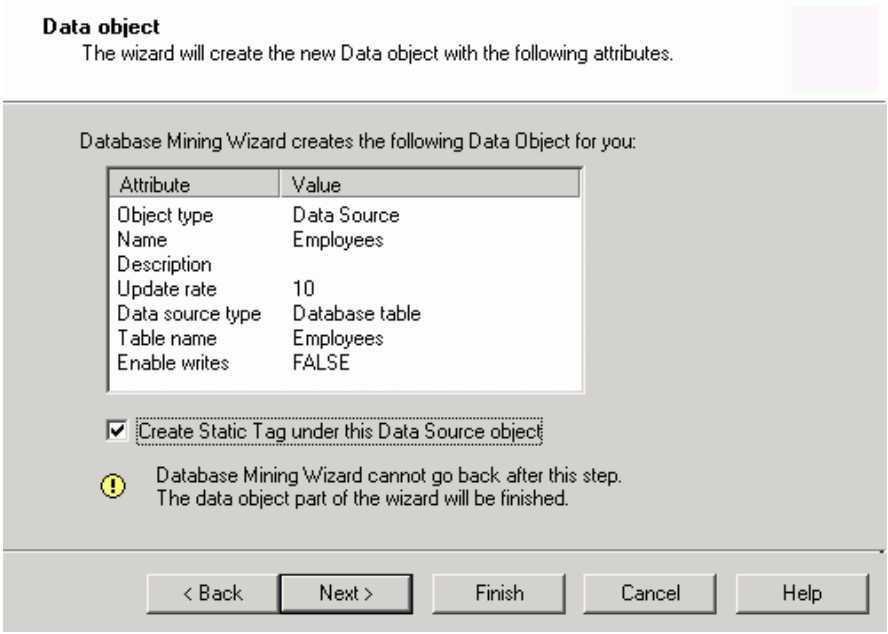
12. Click the Add button in the wizard. This opens the Unified Data Browser, which lists all the columns in the database table, as shown in the figure below. Select the column name (e.g. FirstName) from the database table.



Selecting Column From Database Table

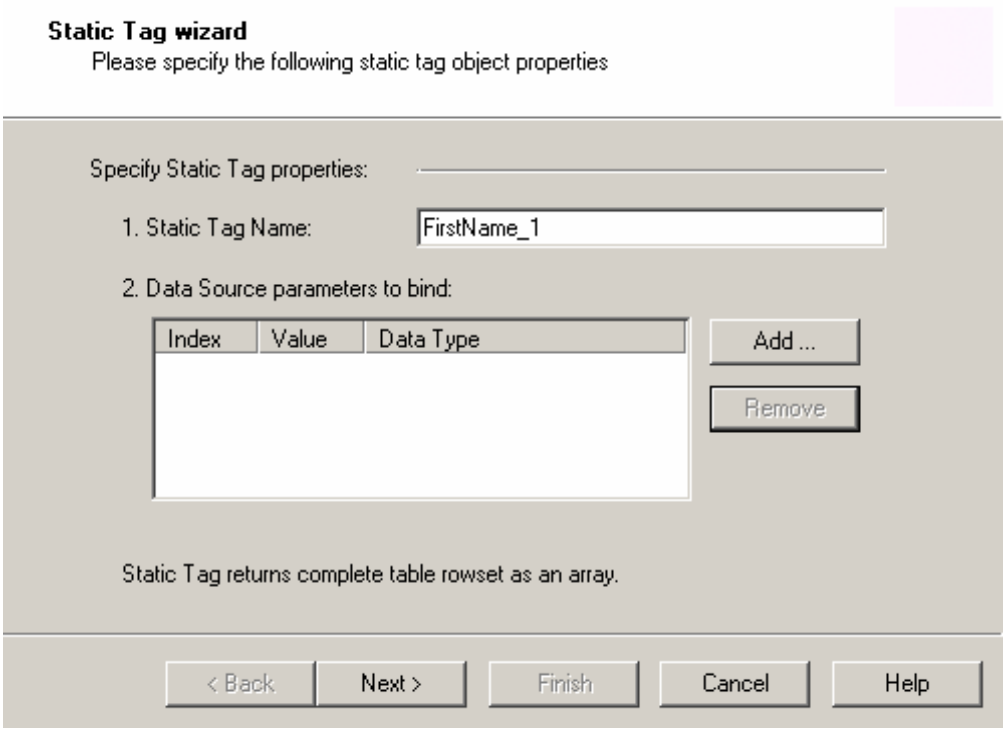
13. The Wizard displays the data source information that you specified, as shown in the figure below. Click the Next button to complete the data source connection. The next step is to define data items (values) to read from the data source. You have the option of creating a static data item or a dynamic data item (option depends on the type of database connection). A static data item simply displays data values from the connected database. A dynamic data item allows you to manipulate data values from the connected database. To configure a static data item, check the Create Static Tag Under This Data Source check box.

NOTE
You cannot go back after this step.



Data-Mining Wizard: Confirming Data Source Connection

14. Now you will define a data item (value) to read from the data source (e.g. the FirstName column). Give the data item a name (e.g. FirstName_1), as shown in the figure below.



Data-Mining Wizard: Defining a Value to Read

15. Now you need to specify a value to read from the selected column in the database table. The value corresponds to the record number in the database. For example, in the First Name column in the database, record number 1 is the value Nancy.

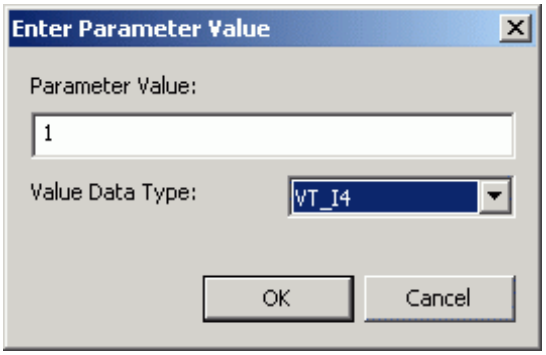
Employees : Table

	Employee ID	Last Name	First Name	Title
▶	1	Davolio	Nancy	Sales Representative
	2	Fuller	Andrew	Vice President, Sales
	3	Leverling	Janet	Sales Representative
	4	Peacock	Margaret	Sales Representative
	5	Buchanan	Steven	Sales Manager
	6	Suyama	Michael	Sales Representative
	7	King	Robert	Sales Representative
	8	Callahan	Laura	Inside Sales Coordinator
	9	Dodsworth	Anne	Sales Representative
*	(AutoNumber)			

Record: 1 of 9

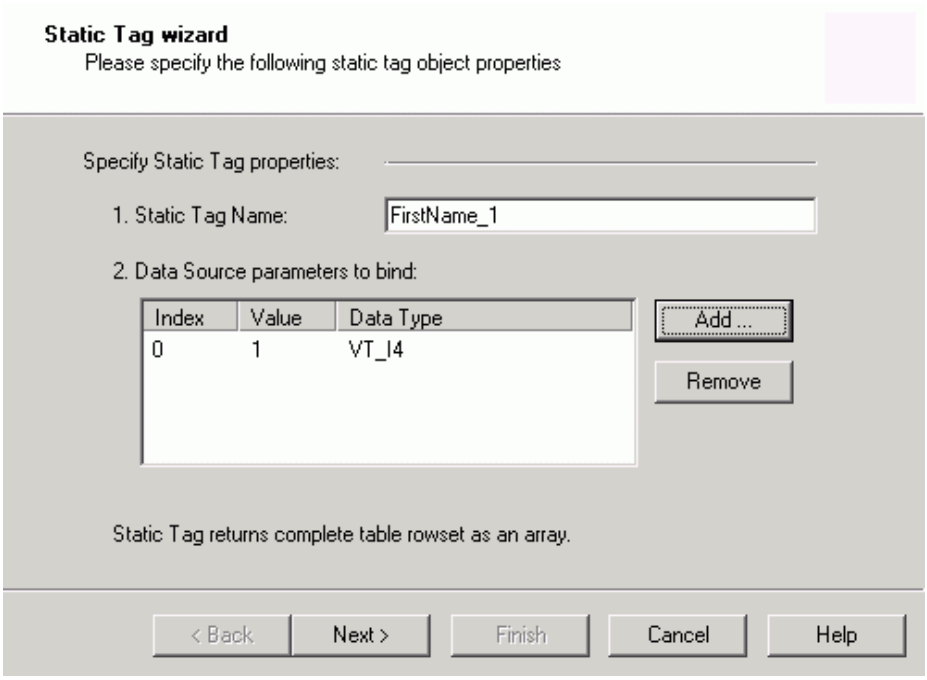
Employees Table in Northwind Database

16. Click the Add button in the Wizard. To read the value Nancy, enter 1 as the Parameter Value, as shown in the figure below.



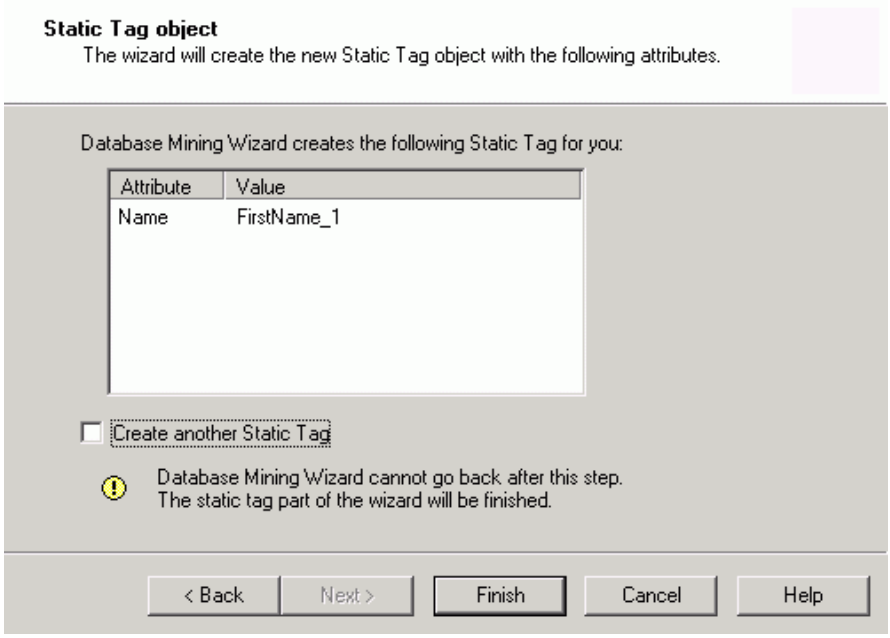
Data-Mining Wizard: Defining a Value to Read

17. The value is added to the parameters to bind section, as shown in the figure below. To read the value Nancy, enter 1 as the Parameter Value, as shown in the figure below.



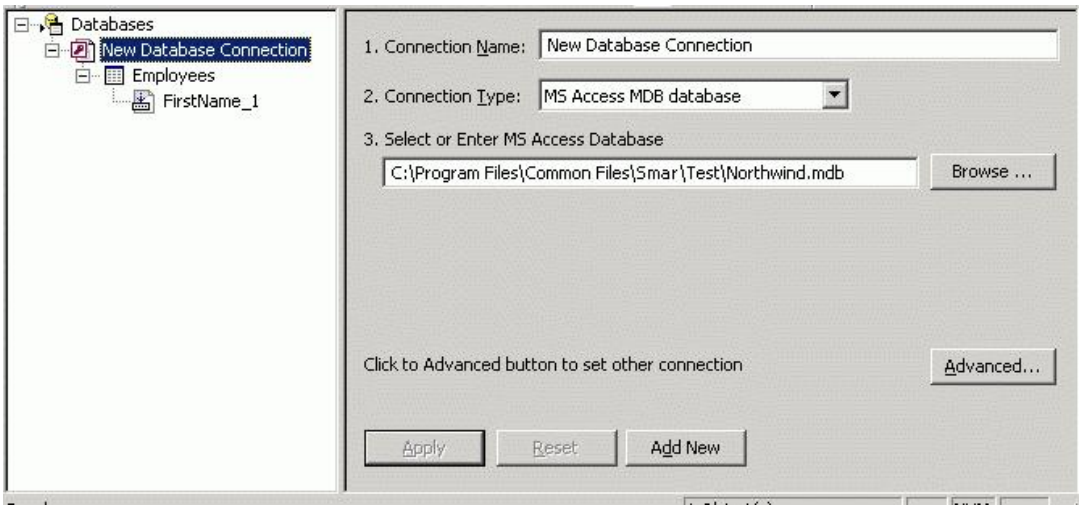
Data-Mining Wizard: Defining a Value to Read

18. The Wizard displays the data item information that you specified, as shown in the figure below. You have the option of creating additional data items (tags). In this case, we will click the Finish button to complete the configuration.


Static Tag object
The wizard will create the new Static Tag object with the following attributes.
Database Mining Wizard creates the following Static Tag for you:
Attribute
Value
Name
FirstName_1
Create another Static Tag
Database Mining Wizard cannot go back after this step.
The static tag part of the wizard will be finished.
< Back
Next >
Finish
Cancel
Help

Data-Mining Wizard: Confirming Data Item Value

19. The new configuration that you created using the Wizard appears in the Data Mining Configurator, as shown in the figure below.

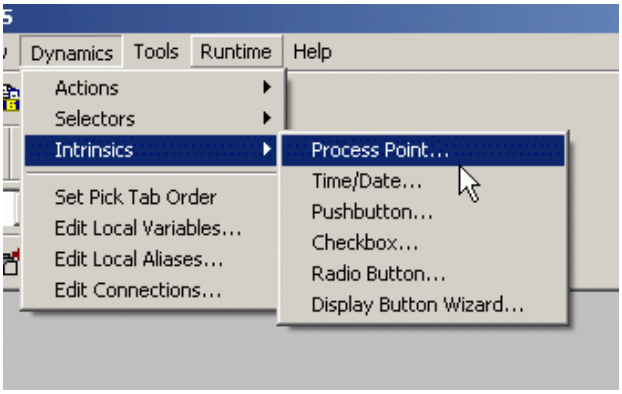


New Wizard Configuration in Data Mining Configurator

20. The next step is to connect to the new data item and visualize the data in a GraphWorX display. To a new GraphWorX display, select **Start > Programs > Smar ProcessView > ProjectWorX > GraphWorX**.

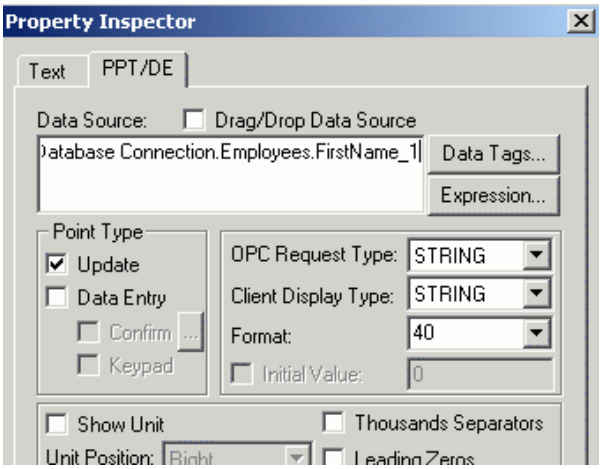
NOTE
Before you can visualize the data, you must activate the data mining configuration database by selecting Make Active from the File menu.

21. You need to configure your data mining connections so you can view data coming from the database. Create a process point in GraphWorX by selecting Intrinsics > Process Point from the Dynamics menu, as shown in the figure below.



Creating a Process Point in GraphWorX

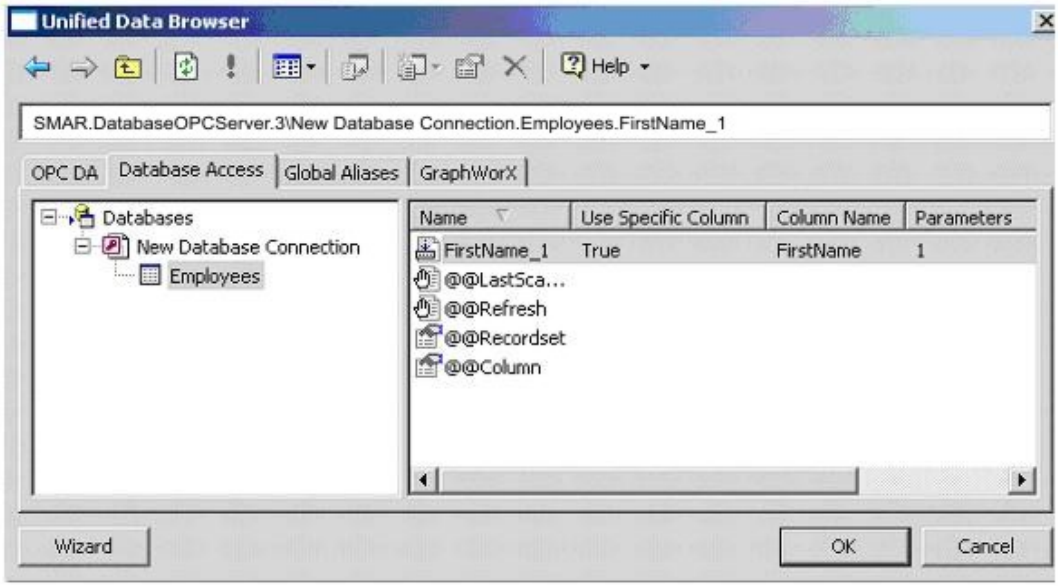
22. This opens the Property Inspector for the data item. Click on the PPT/DE tab, as shown in the figure below. Click the Data Tags button.



Property Inspector for FirstName_1 Data Item

23. The Unified Data Browser opens to the **Database Access** tab, as shown in the figure below. You can see that the browser tree control is similar to the tree control in the Data Mining Configurator; you can choose from configured data items from the **Employees** data source connection. Select the **FirstName_1** data item. Notice that the **FirstName_1** item ID (e.g. **SMAR.DatabaseOPCServer.3\New Database Connection.Employees.FirstName_1**) contains the following information:

- Server name (e.g. SMAR.DatabaseOPCServer.3\)
- Database connection name (e.g. New Database Connection)
- Data source name (e.g. Employees)'
- Data item name (e.g. FirstName_1)



New Database Connection Shown in Unified Data Browser

24. Close out of the Unified Data Browser and the Property Inspector dialog box.

25. Enter the GraphWorX display into runtime mode. You can see the data coming from the Employees database table. The Parameter Value for data item FirstName_1 is resolved as Nancy in the visualization display.

Basic Steps in the Data Mining Configuration Wizard

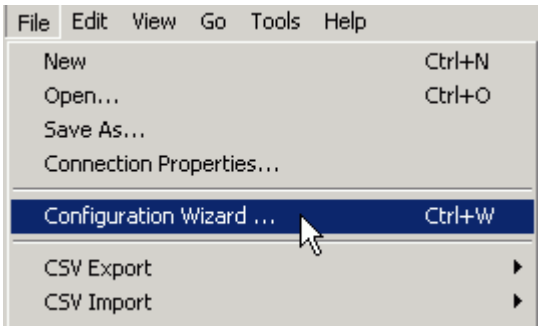
Using the **Data Mining Configuration Wizard** to configure your database connections involves the following basic steps:
Step 1: Start the **Data Mining Configuration Wizard.**
Step 2: Choose a data object (data source or data manipulator) you would like to create.
Step 3: Create a new database connection or choose an existing database connection.
Step 4: Configure data source or data manipulator properties.
Step 5: Configure data item properties (for a data source only).
The new configuration that you created using the Wizard appears in the Data Mining Configurator.

Before you can visualize the data, you must activate the data mining configuration database by selecting **Make Active** from the **File** menu.

Step 1: Starting the Data Mining Configuration Wizard

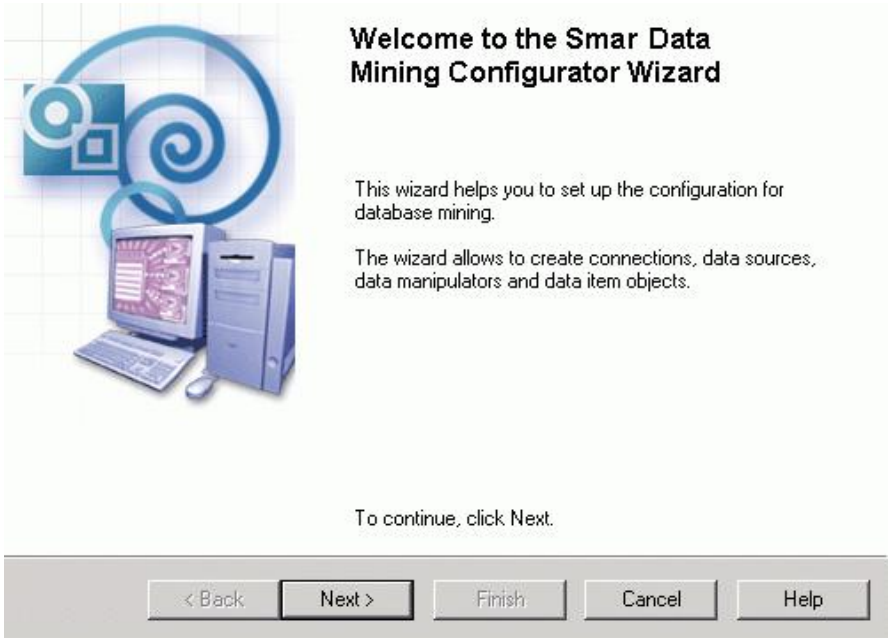
To start the **Data Mining Configuration Wizard:**

1. Select **Configuration Wizard** from the **File** menu, as shown in the figure below.



Starting the Data-Mining Configuration Wizard

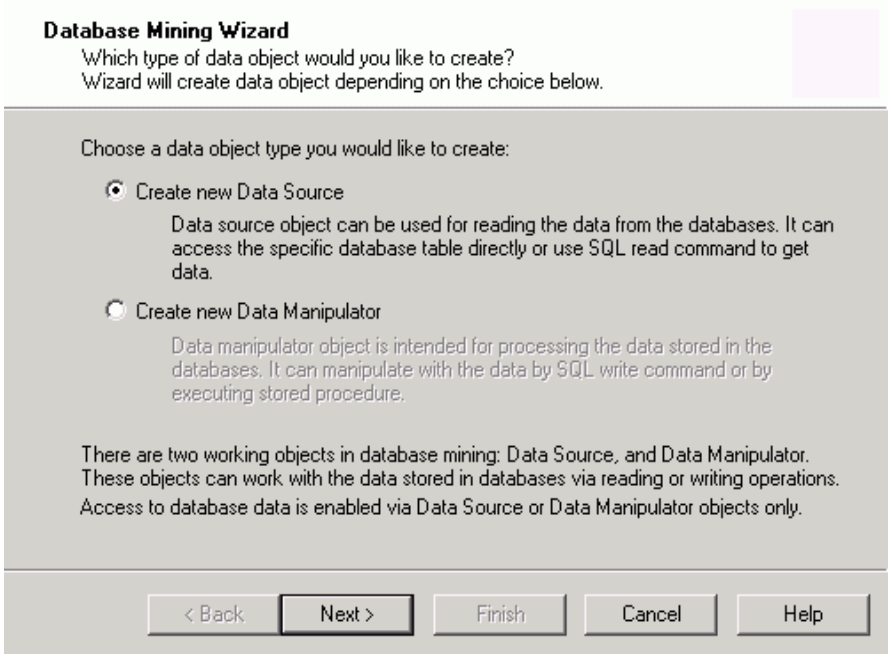
2. The introduction screen for the Data Mining Wizard appears. Click the **Next** button to continue.


Welcome to the Smar Data Mining Configurator Wizard
This wizard helps you to set up the configuration for database mining.
The wizard allows to create connections, data sources, data manipulators and data item objects.
To continue, click Next.
< Back
Next >
Finish
Cancel
Help

Data-Mining Wizard: Welcome Screen

Step 2: Choosing a Data Object

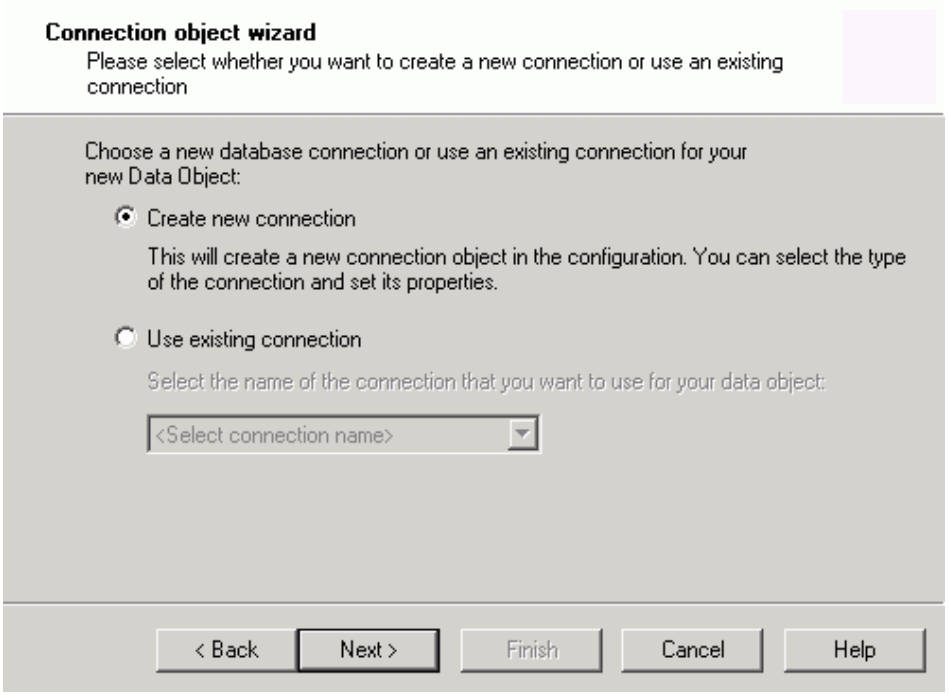
In the Data Mining Configuration Wizard, you have two options for the data object type: Create a New Data Source or Create a New Data Manipulator, as shown in the figure below. A data source can be use to read data from a database. It can access a specific database table directly or use a SQL *read* command to get data. A data manipulator, which is intended for processing data stored in a connected database, manipulates data using a SQL *write* command or by executing a stored procedure. Choose an option, and then click the Next button to continue.


Database Mining Wizard
Which type of data object would you like to create?
Wizard will create data object depending on the choice below.
Choose a data object type you would like to create:
Create new Data Source
Data source object can be used for reading the data from the databases. It can access the specific database table directly or use SQL read command to get data.
Create new Data Manipulator
Data manipulator object is intended for processing the data stored in the databases. It can manipulate with the data by SQL write command or by executing stored procedure.
There are two working objects in database mining: Data Source, and Data Manipulator. These objects can work with the data stored in databases via reading or writing operations.
Access to database data is enabled via Data Source or Data Manipulator objects only.
< Back
Next >
Finish
Cancel
Help

Data-Mining Wizard: Data Object Options

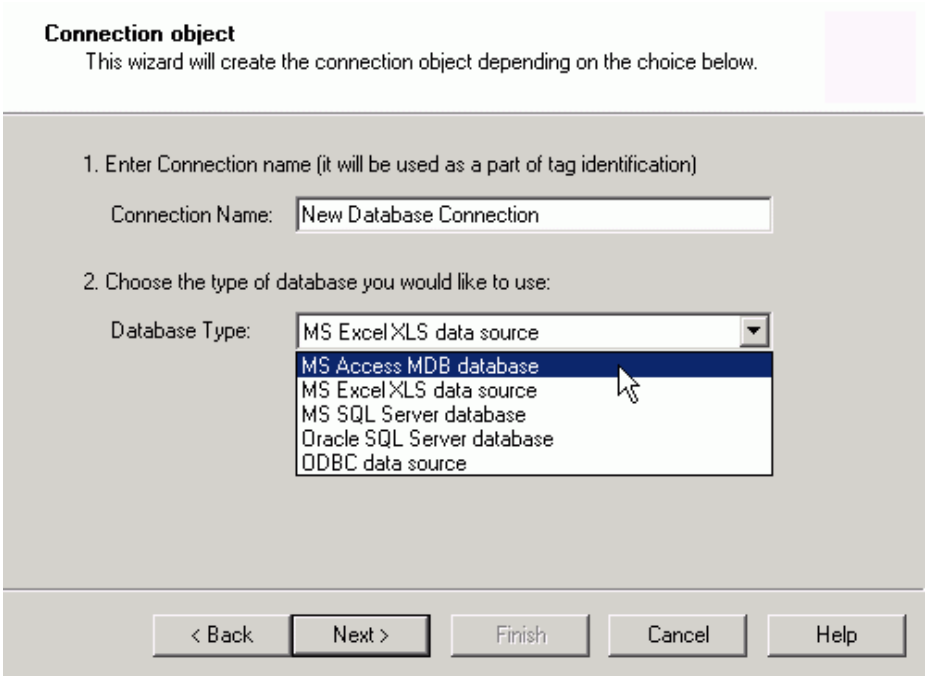
Step 3: Connecting to a Database
After you select a data object (data source or data manipulator), the next step in the Data Mining Wizard is to connect to a database (i.e. where to get the data).
Note: For additional information about configuring database connections, please see the "Database Connections" section later in this document.

1. You have two options for database connection: **Create a New Connection** or **Use an Existing Connection,** as shown in the figure below. Choose an option, and then click the **Next** button to continue.


Connection object wizard
Please select whether you want to create a new connection or use an existing connection
Choose a new database connection or use an existing connection for your new Data Object:
Create new connection
This will create a new connection object in the configuration. You can select the type of the connection and set its properties.
Use existing connection
Select the name of the connection that you want to use for your data object:
<Select connection name>
< Back
Next >
Finish
Cancel
Help

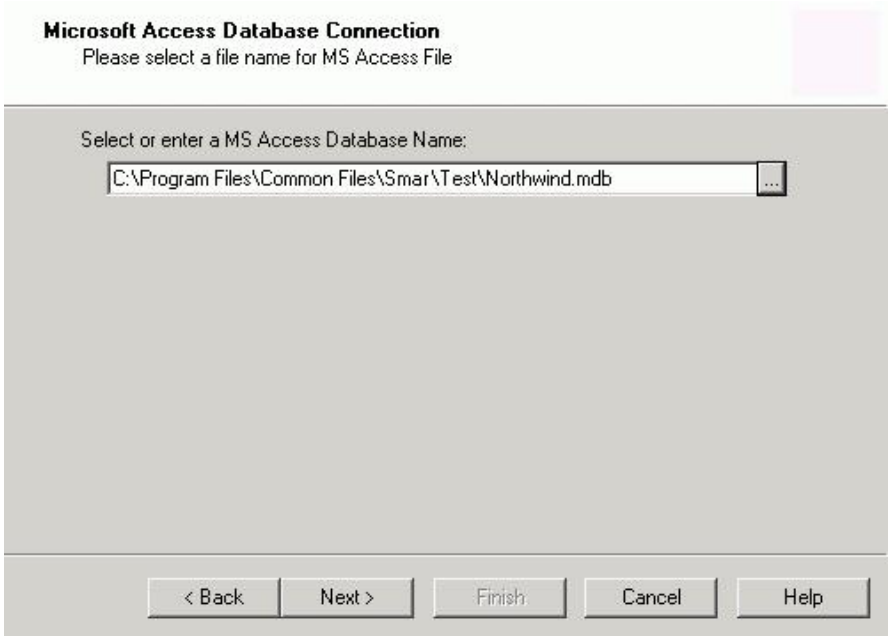
Data-Mining Wizard: Database Connection Options

2. In the **Connection Name** field, enter a name for the new database connection. Then select the type of database (e.g. Microsoft Access, Microsoft SQL Server, Microsoft Excel, or Oracle) you would like to use from the drop-down list, as shown in the figure below. Click the **Next** button to continue.


Connection object
This wizard will create the connection object depending on the choice below.
1. Enter Connection name (it will be used as a part of tag identification)
Connection Name:
New Database Connection
2. Choose the type of database you would like to use:
Database Type:
MS Excel XLS data source
MS Access MDB database
MS Excel XLS data source
MS SQL Server database
Oracle SQL Server database
ODBC data source
< Back
Next >
Finish
Cancel
Help

Data-Mining Wizard: Creating New Database Connection

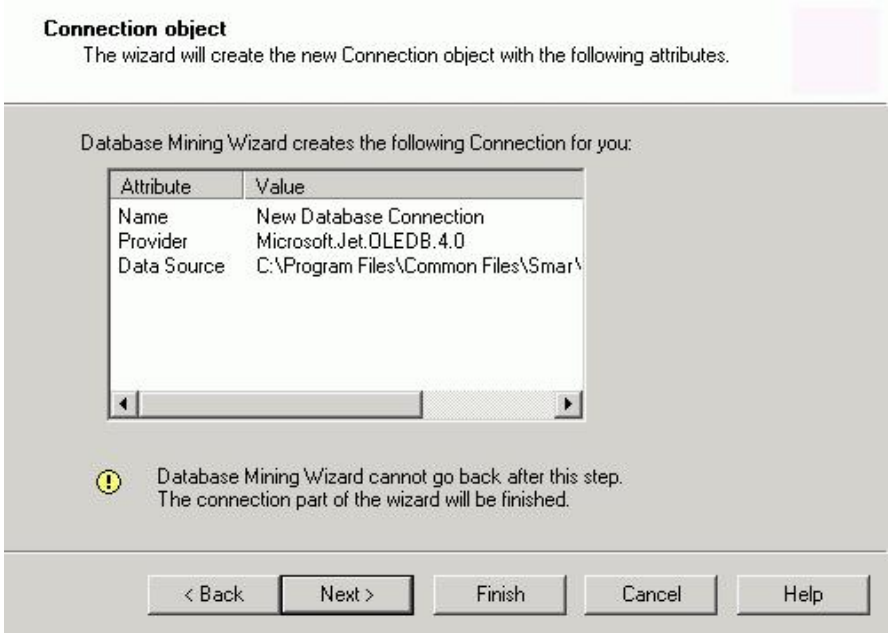
3. Specify the database, as shown in the figure below (which shows a Microsoft Access database connection). The example below uses the Northwind.mdb database, which is installed with Microsoft Access. Click the **Next** button to continue.



Data-Mining Wizard: Specifying Database

4. The Wizard displays the database connection information that you specified, as shown in the figure below. Click the **Next** button to complete the database connection.

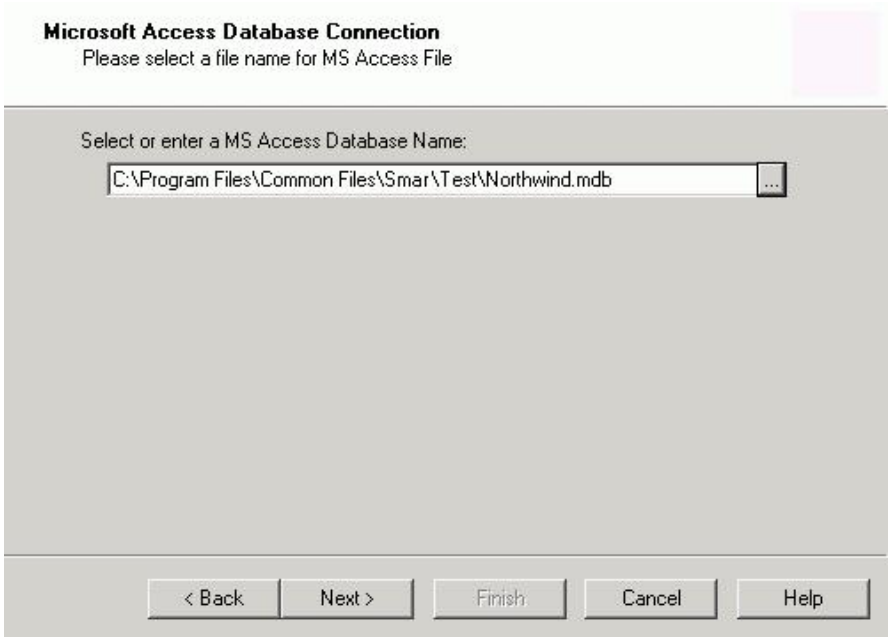
NOTE
You cannot go back after this step.



Data-Mining Wizard: Confirming Database Connection

Microsoft Access Wizard

To create a Microsoft Access database connection in the Data Mining Wizard, click the **…** button and select an Access (.mdb) file, as shown in the figure below. Click the **Next** button to continue.

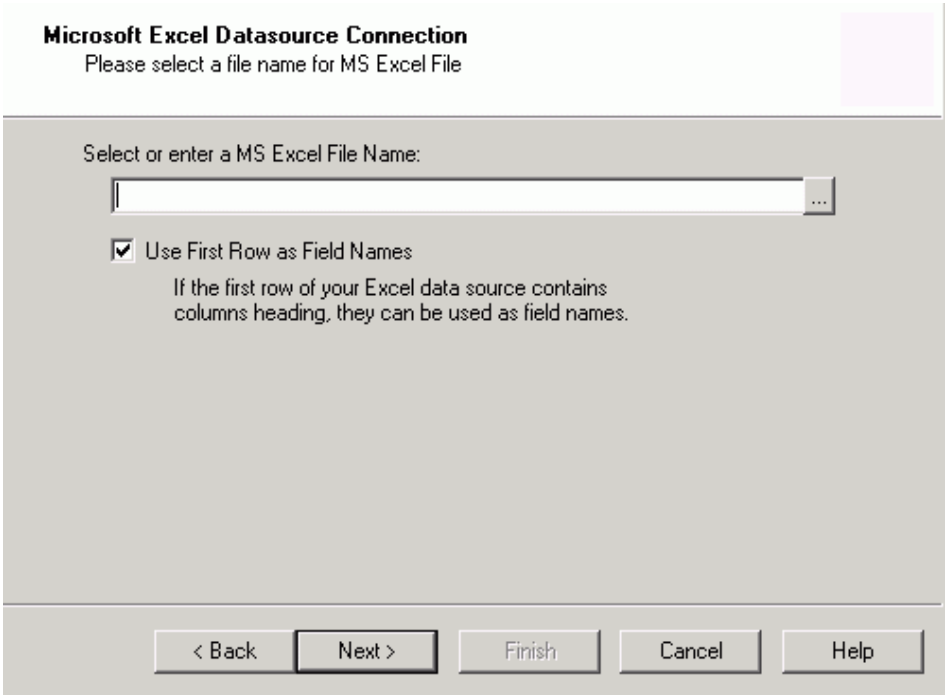


Data-Mining Wizard: Microsoft Access Connection

Microsoft Excel Wizard

To create a Microsoft Excel database connection in the Data Mining Wizard, click the … button and select an Excel (.xls) file, as shown in the figure below. Click the Next button to continue. If the first row of your Excel data source (e.g. spreadsheet) contains column headings, you can choose to use the column headings as field names by checking the Use First Row as Field Names check box, as

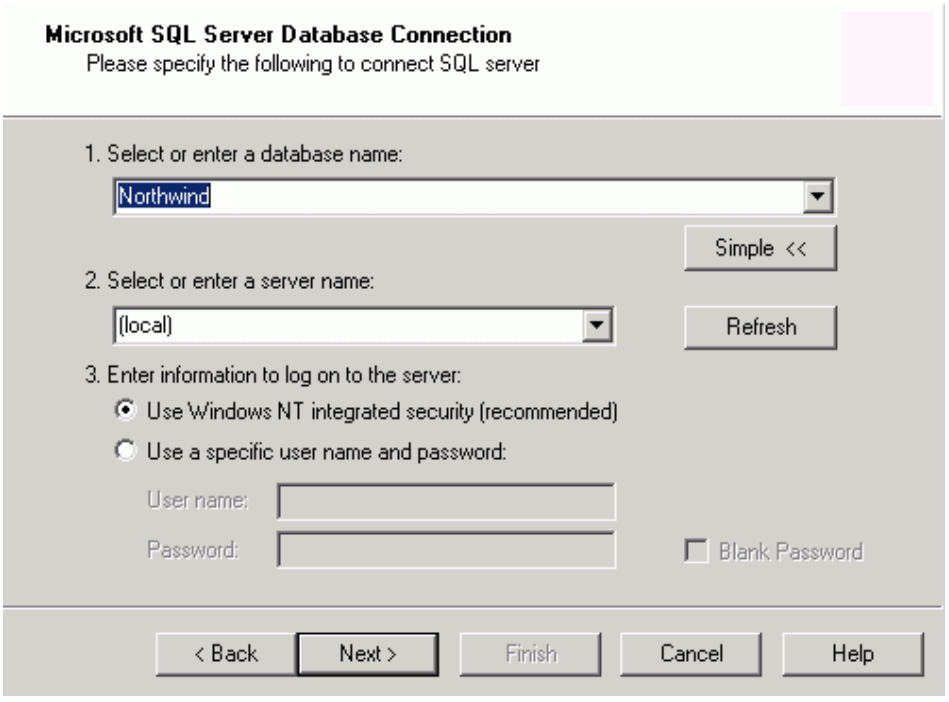
shown in the figure below. Click the Next button to continue.


Microsoft Excel Datasource Connection
Please select a file name for MS Excel File
Select or enter a MS Excel File Name:
...
Use First Row as Field Names
If the first row of your Excel data source contains columns heading, they can be used as field names.
< Back
Next >
Finish
Cancel
Help

Data-Mining Wizard: Microsoft Excel Connection

Microsoft SQL Server Wizard

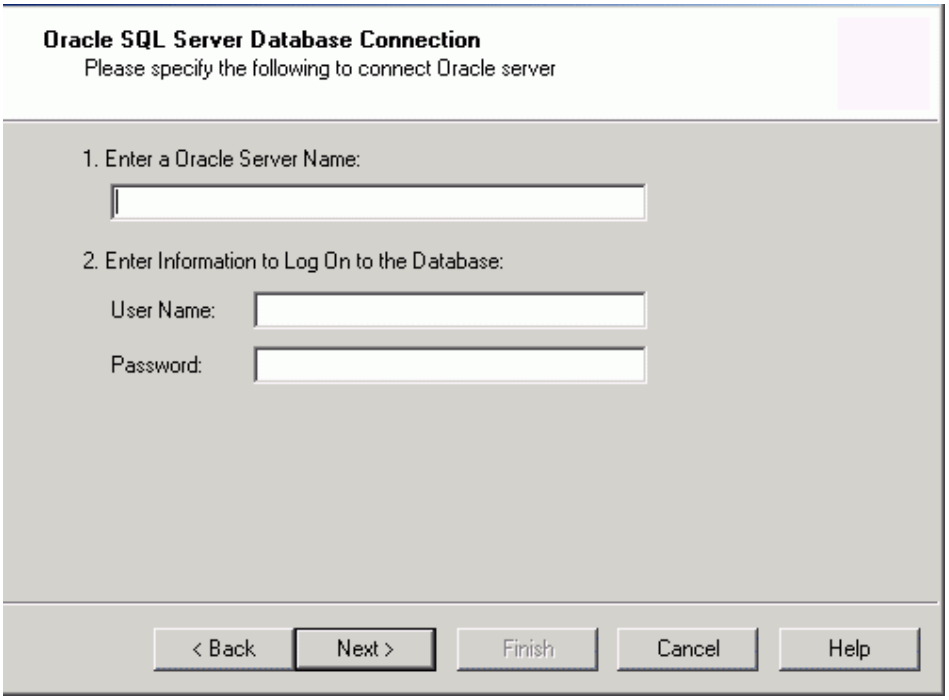
To create a Microsoft SQL Server database connection in the Data Mining Wizard, select a SQL Server from the drop-down list. The default SQL server is "(local)." Then select the database on the specified SQL Server file, as shown in the figure below. By default, SQL Server database connections use Windows integrated security. Click the **Next** button to continue.



Data-Mining Wizard: Microsoft SQL Server Connection

Oracle Wizard

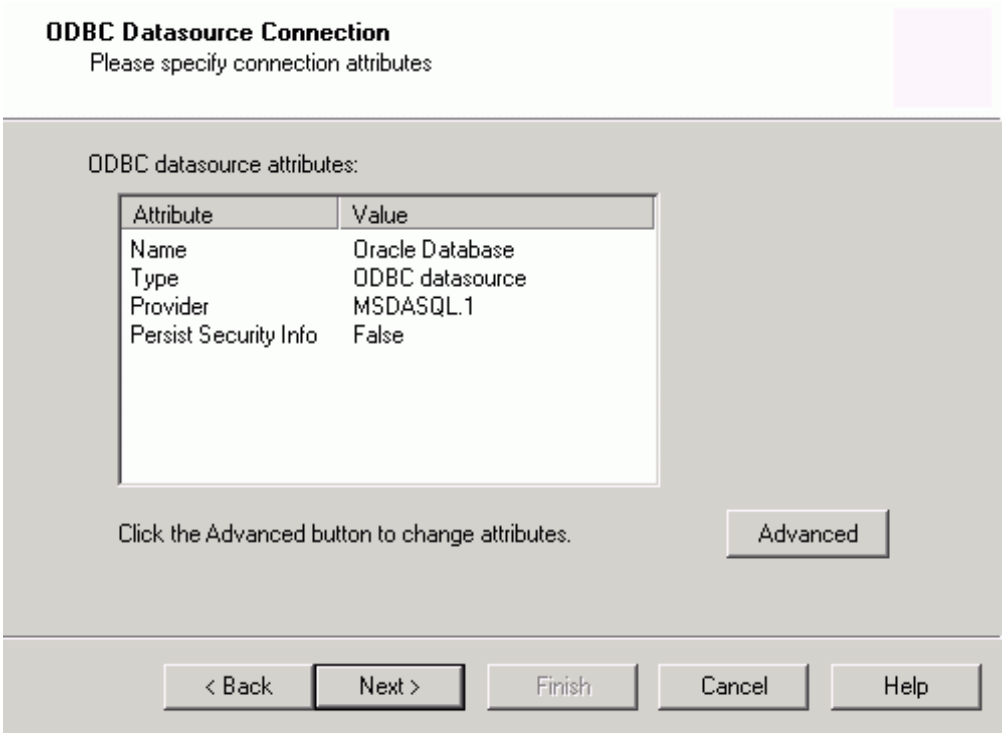
To create an Oracle database connection in the Data Mining Wizard, specify an Oracle database name. Then supply the User Name and Password required to log on to the specified Oracle database, as shown in the figure below. Click the Next button to continue.



Data-Mining Wizard: Oracle Connection

ODBC Wizard

To create an ODBC database connection in the Data Mining Wizard, click the **Advanced** button to establish database connections through the Windows **Data Link Properties.** Click the **Next** button to continue.



Data-Mining Wizard: ODBC Connection

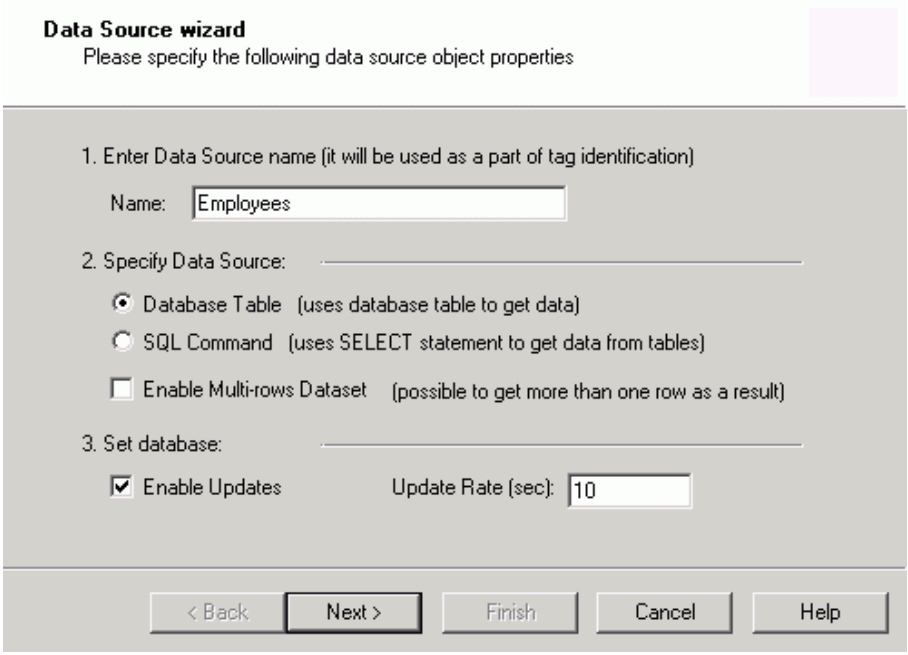
Step 4: Configuring the Data Object
After you connect to a database, the next step in the Data Mining Wizard is to configure the data source or data manipulator.
Note: For additional information about configuring data sources, please see the "Data Source Properties" section later in this document. For additional information about configuring data manipulators, please see the "Data Manipulator Properties" section later in this document.

Data Source Wizard: Database Table

To configure the data source properties in the Data Mining Wizard:

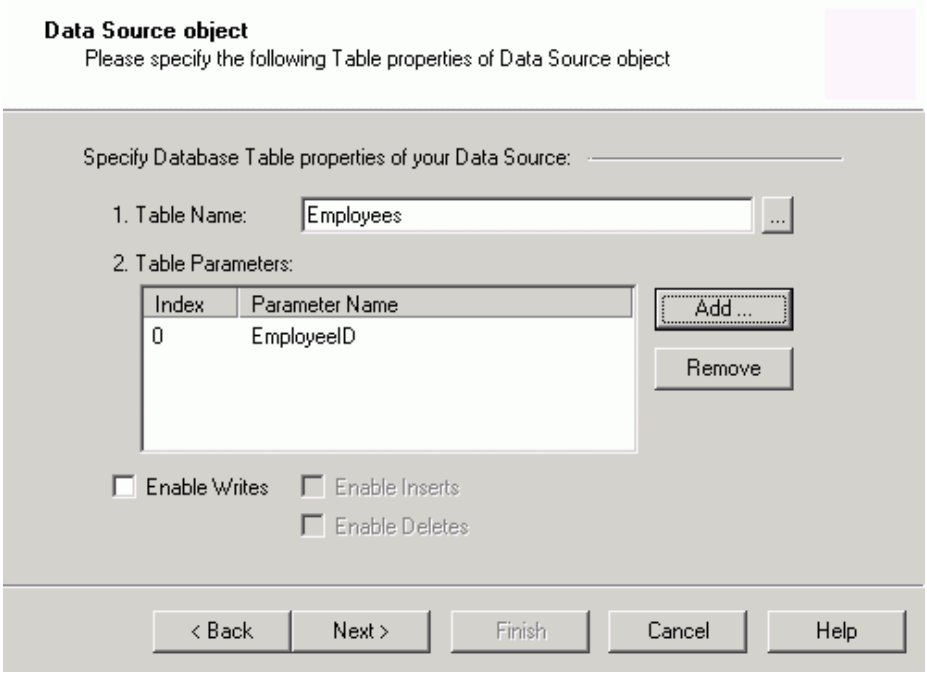
1. Select **Database Table,** as shown in the figure below. Click the **Next** button.

NOTE
You cannot go back after this step.


Data Source wizard
Please specify the following data source object properties
1. Enter Data Source name (it will be used as a part of tag identification)
Name: Employees
2. Specify Data Source:
Database Table (uses database table to get data)
SQL Command (uses SELECT statement to get data from tables)
Enable Multi-rows Dataset (possible to get more than one row as a result)
3. Set database:
Enable Updates
Update Rate (sec): 10
< Back
Next >
Finish
Cancel
Help

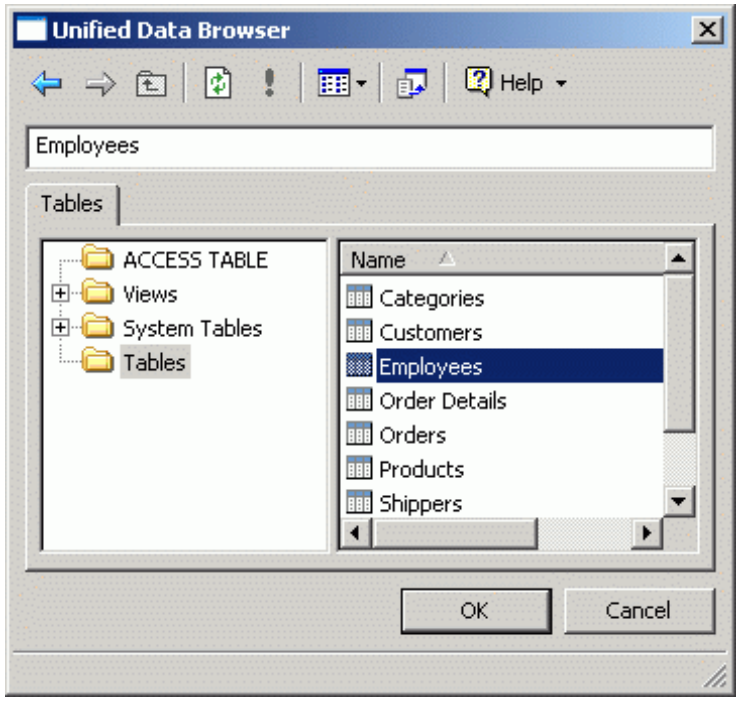
Data-Mining Wizard: Data Source Properties

2. In the Table Name field, click the … button, as shown in the figure below.



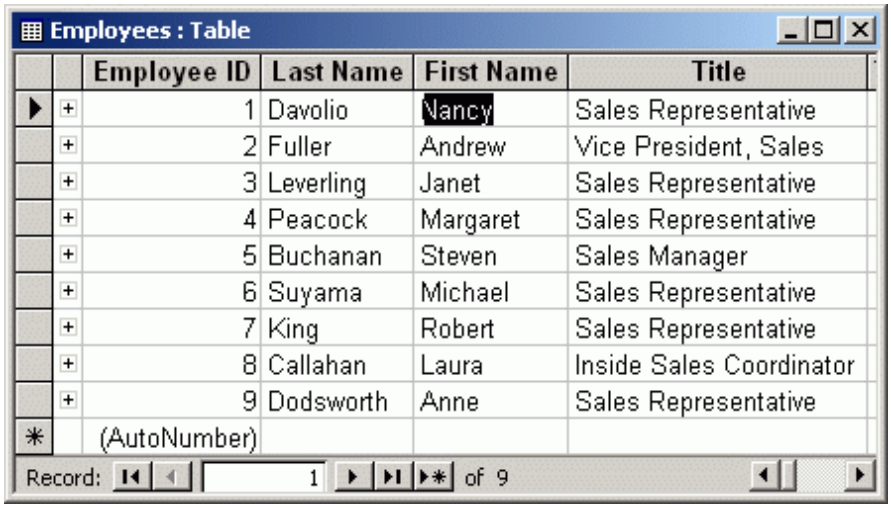
Data-Mining Wizard: Selecting a Database Table

3. This opens the Unified Data Browser, which lists all the tables in the database, as shown in the figure below. Select a table (e.g. Employees), and then click OK.



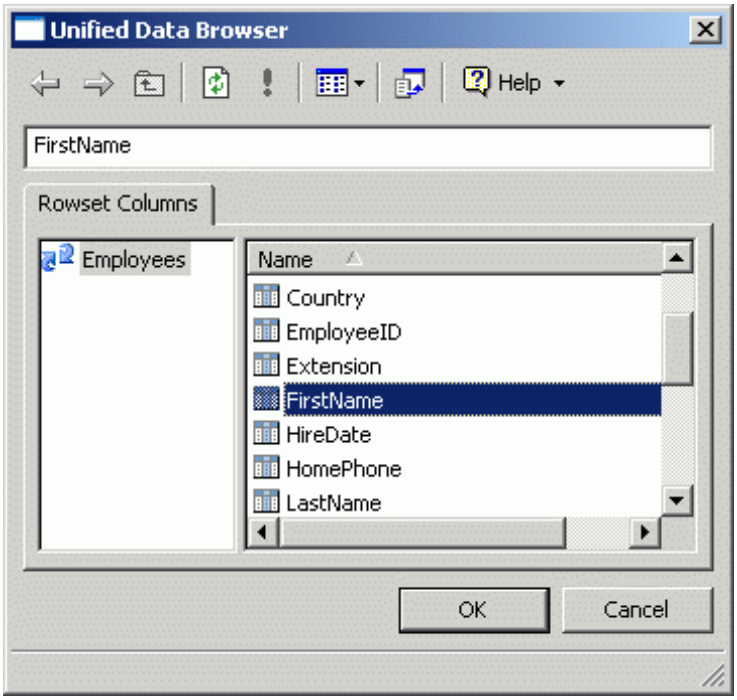
Selecting a Database Table

4. If you view the database table in Microsoft Access, you can see the column names (e.g. Employee ID, Last Name, First Name, etc.) in the Employees table, as shown in the figure below. The next step is to select a column name from which to read the data. For example, we will use the First Name column, which lists several employee names (e.g. Nancy, Andrew, Janet, etc.).



Employees Table in Northwind Database

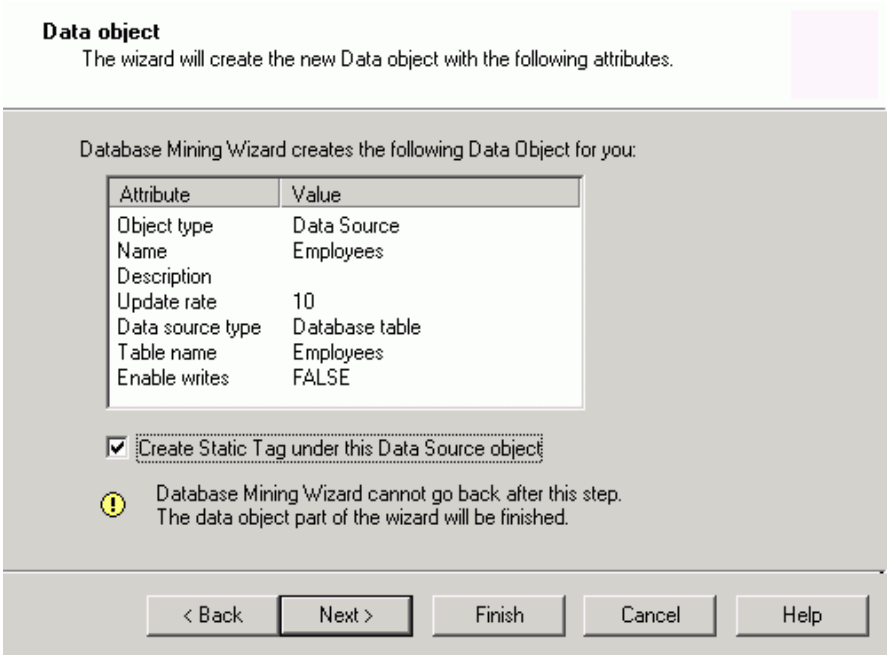
5. Click the Add button in the wizard. This opens the Unified Data Browser, which lists all the columns in the database table, as shown in the figure below. Select the column name (e.g. FirstName) from the database table.



Selecting Column From Database Table

6. The Wizard displays the data source information that you specified, as shown in the figure below. Click the Next button to complete the data source connection. The next step is to define data items (values) to read from the data source. You have the option of creating a static data item or a dynamic data item (option depends on the type of database connection). A static data item simply displays data values from the connected database. A dynamic data item allows you to manipulate data values from the connected database. To configure a static data item, check the Create Static Tag Under This Data Source check box.

NOTE
You cannot go back after this step.



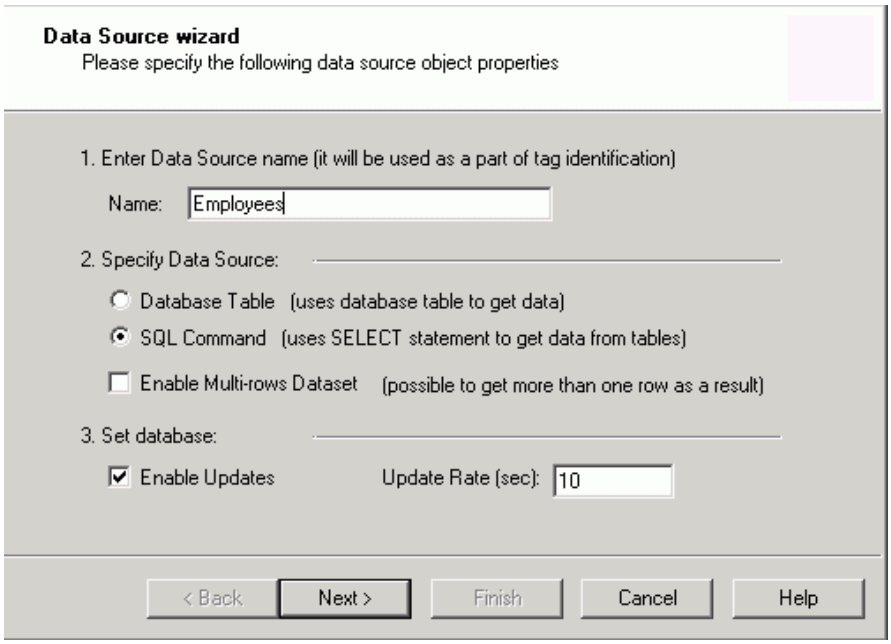
Data-Mining Wizard: Confirming Data Source Connection

Data Source Wizard: SQL Command

To configure the data source properties in the Data Mining Wizard:

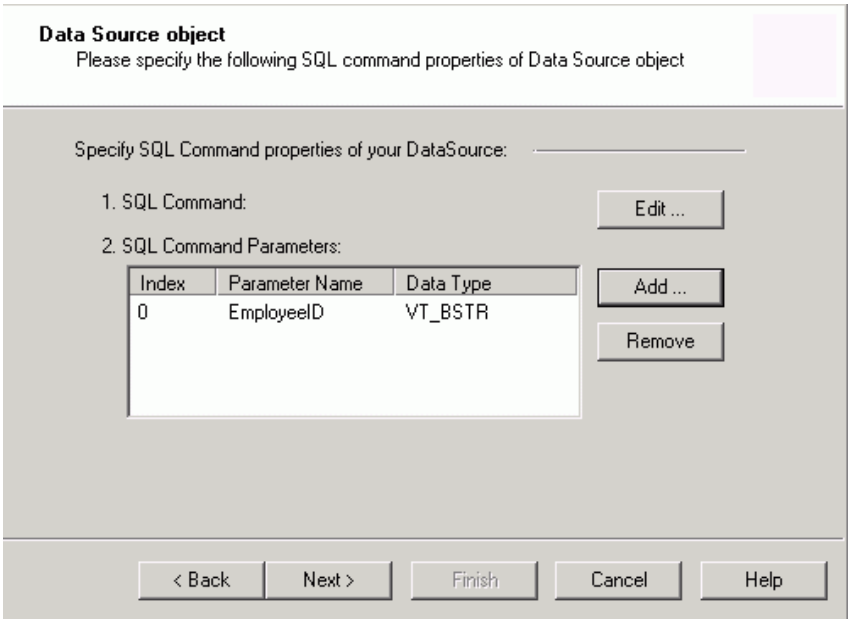
7. Select SQL Command, as shown in the figure below. Click the Next button.

NOTE
You cannot go back after this step.


Data Source wizard
Please specify the following data source object properties
1. Enter Data Source name (it will be used as a part of tag identification)
Name: Employees
2. Specify Data Source:
Database Table (uses database table to get data)
SQL Command (uses SELECT statement to get data from tables)
Enable Multi-rows Dataset (possible to get more than one row as a result)
3. Set database:
Enable Updates
Update Rate (sec): 10
< Back
Next >
Finish
Cancel
Help

Data-Mining Wizard: Data Source Properties

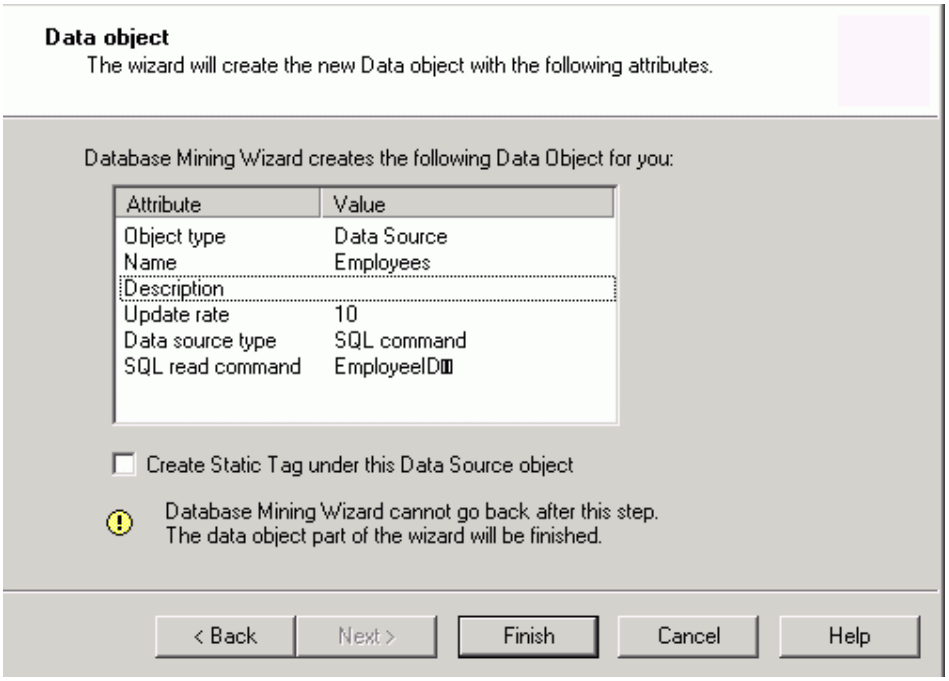
In the SQL Command Parameters field, click the Add button. Enter a Parameter Name (i.e. column name) and choose a Parameter Data Type from the drop-down list. To view or modify the SQL query, click the Edit button. This opens the SQL Command Editor, which enables you to manually edit the query string. Click the Next button.



Data-Mining Wizard: SQL Command Parameters

1. The Wizard displays the data source information that you specified, as shown in the figure below. Click the **Next** button to complete the data source connection. The next step is to define data items (values) to read from the data source. You have the option of creating a static data item or a dynamic data item (option depends on the type of database connection). A **static** data item simply displays data values from the connected database. A **dynamic** data item allows you to manipulate data values from the connected database. To configure a static data item, check the **Create Static Tag Under This Data Source** check box.

NOTE
You cannot go back after this step.

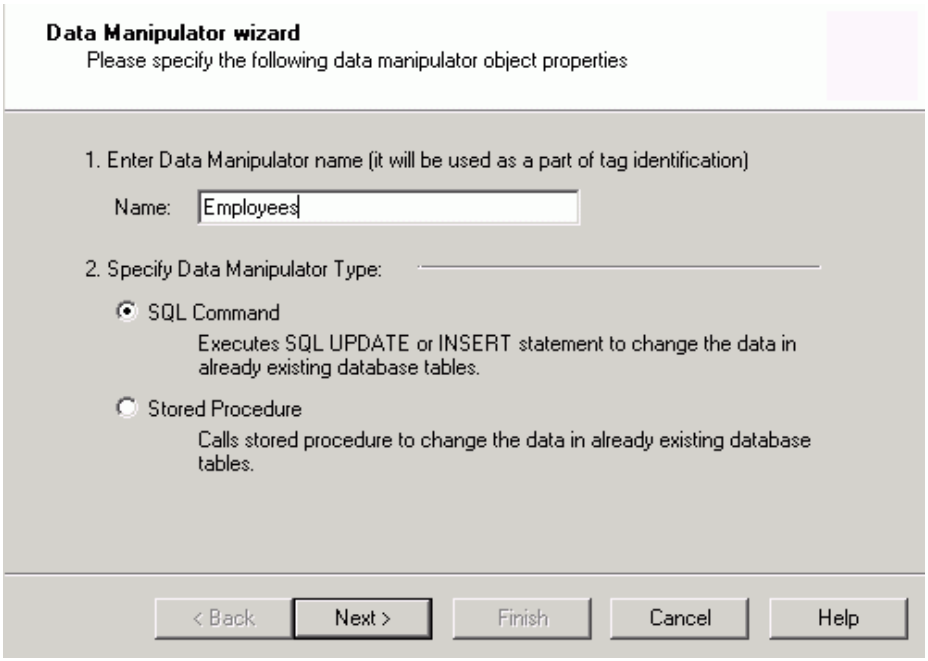


Data-Mining Wizard: Confirming Data Source Connection

Data Manipulator Wizard: SQL Command

To configure the data manipulator properties in the Data Mining Wizard:
Select **SQL Command,** as shown in the figure below. Click the **Next** button.

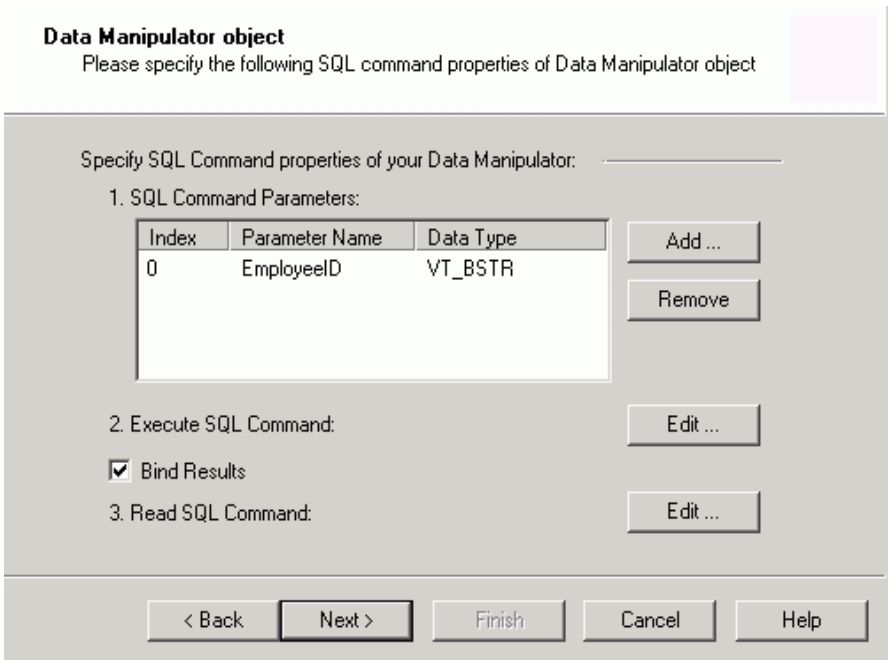
NOTE
You cannot go back after this step.


Data Manipulator wizard
Please specify the following data manipulator object properties
1. Enter Data Manipulator name (it will be used as a part of tag identification)
Name:
Employees
2. Specify Data Manipulator Type:
SQL Command
Executes SQL UPDATE or INSERT statement to change the data in already existing database tables.
Stored Procedure
Calls stored procedure to change the data in already existing database tables.
< Back
Next >
Finish
Cancel
Help

Data-Mining Wizard: Data Manipulator Properties

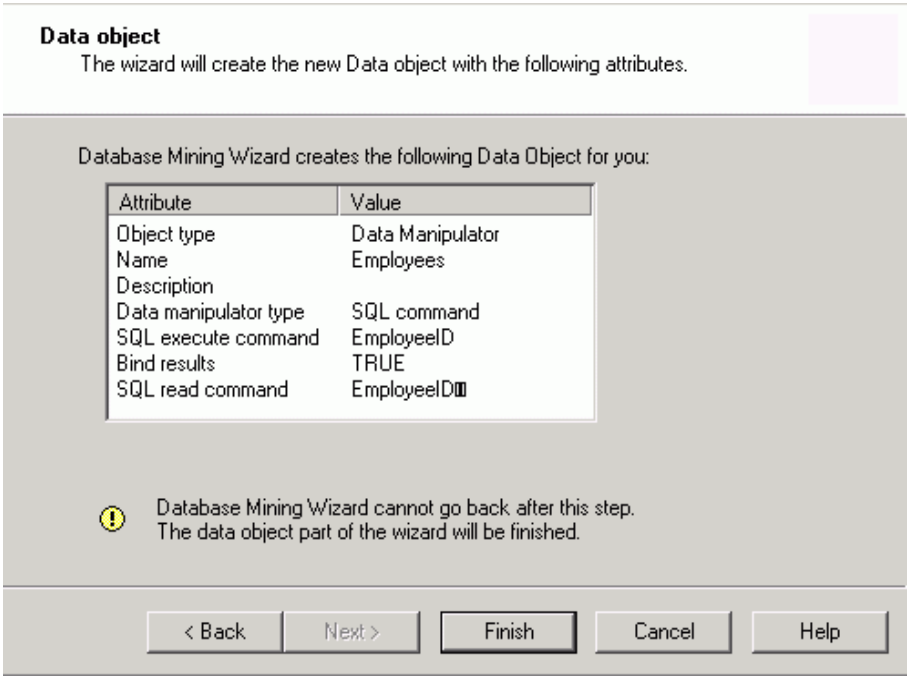
1. In the SQL Command Parameters field, click the Add button. Enter a Parameter Name (i.e. column name) and choose a Parameter Data Type from the drop-down list. To view or modify the SQL query, click the Edit button. This opens the SQL Command Editor, which enables you to manually edit the query string. Click the Next button.

NOTE
When the **Bind Results** check box is checked, it executes "binding" of a SQL query in the same transaction and returns its rowset as output parameters. This allows you to read some database data immediately after executing a data manipulation SQL command (e.g. you can read the ID of a newly created record).



Data-Mining Wizard: SQL Command Parameters

2. The Wizard displays the data manipulator information that you specified, as shown in the figure below. Click the Finish button to complete the data source connection.

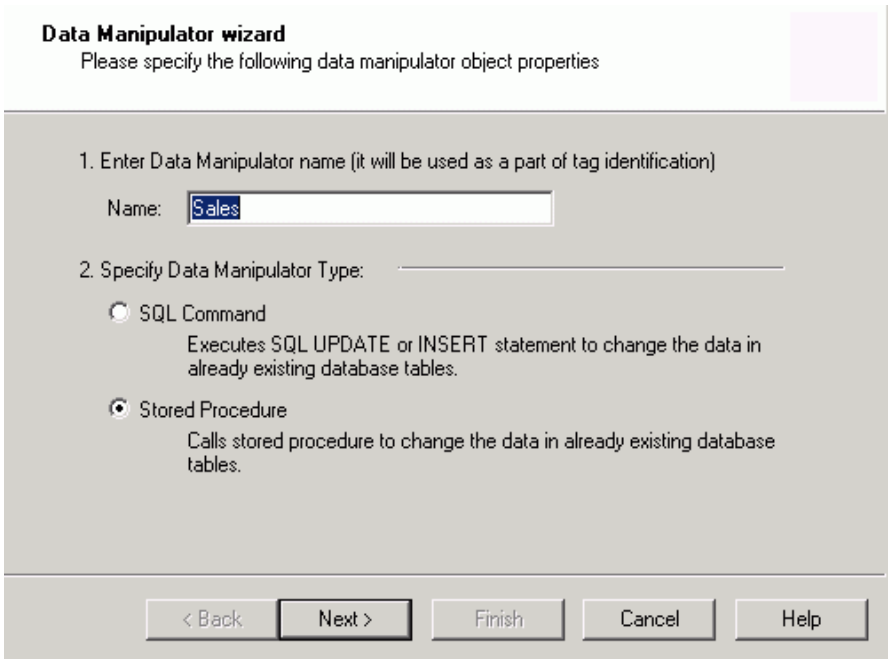


Data-Mining Wizard: Confirming Data Manipulator Connection

Data Manipulator Wizard: Stored Procedure

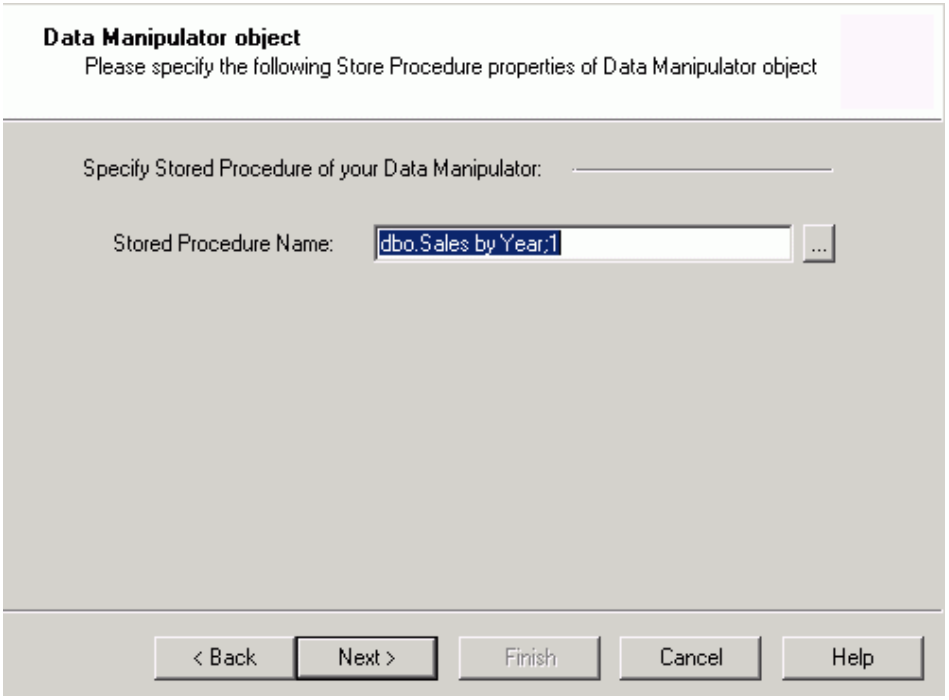
To configure the data manipulator properties in the Data Mining Wizard:
Select **Stored Procedure,** as shown in the figure below. Click the **Next** button.

NOTE
You cannot go back after this step.


Data Manipulator wizard
Please specify the following data manipulator object properties
1. Enter Data Manipulator name (it will be used as a part of tag identification)
Name:
Sales
2. Specify Data Manipulator Type:
SQL Command
Executes SQL UPDATE or INSERT statement to change the data in already existing database tables.
Stored Procedure
Calls stored procedure to change the data in already existing database tables.
< Back
Next >
Finish
Cancel
Help

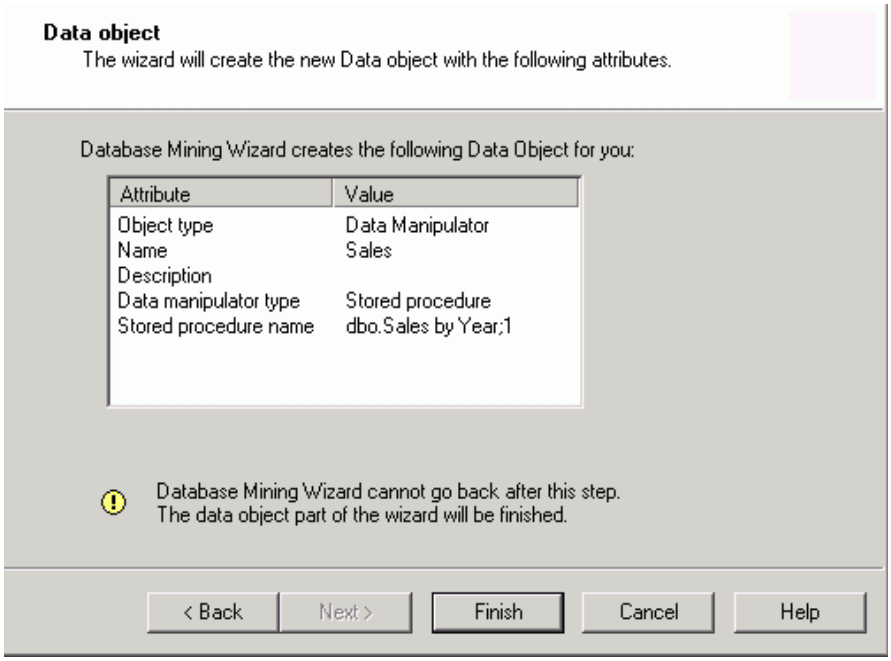
Data-Mining Wizard: Data Manipulator Properties

1. In the Stored Procedure Name field, click the … button. This opens the Unified Data Browser, which lists all the stored procedures in the database. Select a procedure (e.g. "Sales by Year"), and then click OK.



Data-Mining Wizard: Selecting a Stored Procedure

2. The Wizard displays the data manipulator information that you specified, as shown in the figure below. Click the Finish button to complete the data manipulator connection.



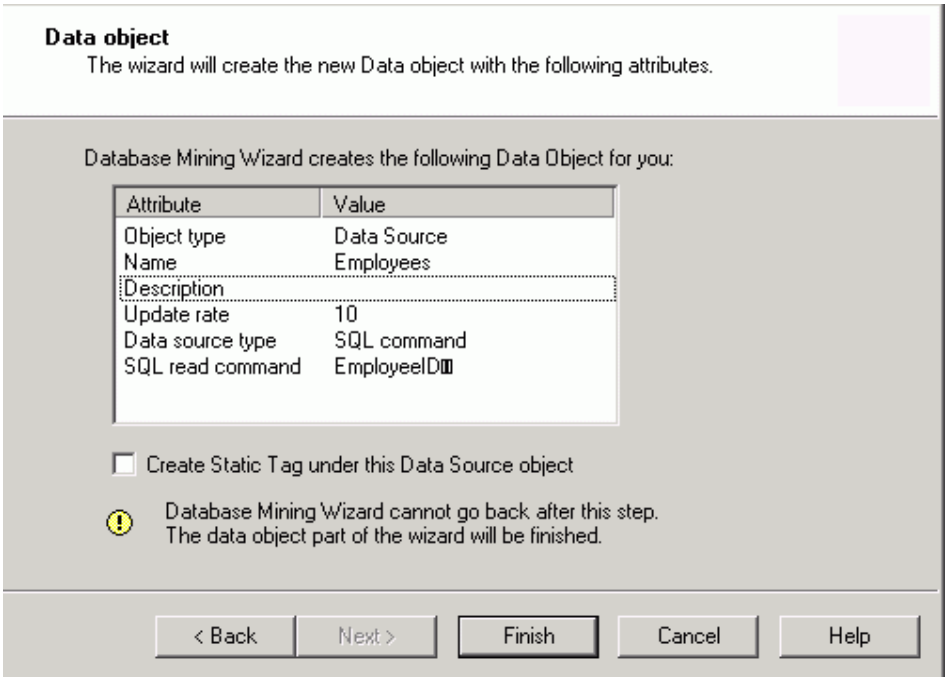
Data-Mining Wizard: Confirming Data Manipulator Connection

Step 5: Configuring Data Items

When you complete a data source configuration using the Data Mining Wizard, the Wizard displays the data source information that you specified, as shown in the figure below. Click the **Next** button to complete the data source connection. The next step is to define data items (values) to read from the

data source. You have the option of creating a static data item or a dynamic data item (option depends on the type of database connection). A **static** data item simply displays data values from the connected database. A **dynamic** data item allows you to manipulate data values from the connected database. To configure a static data item, check the **Create Static Tag Under This Data Source** check box.

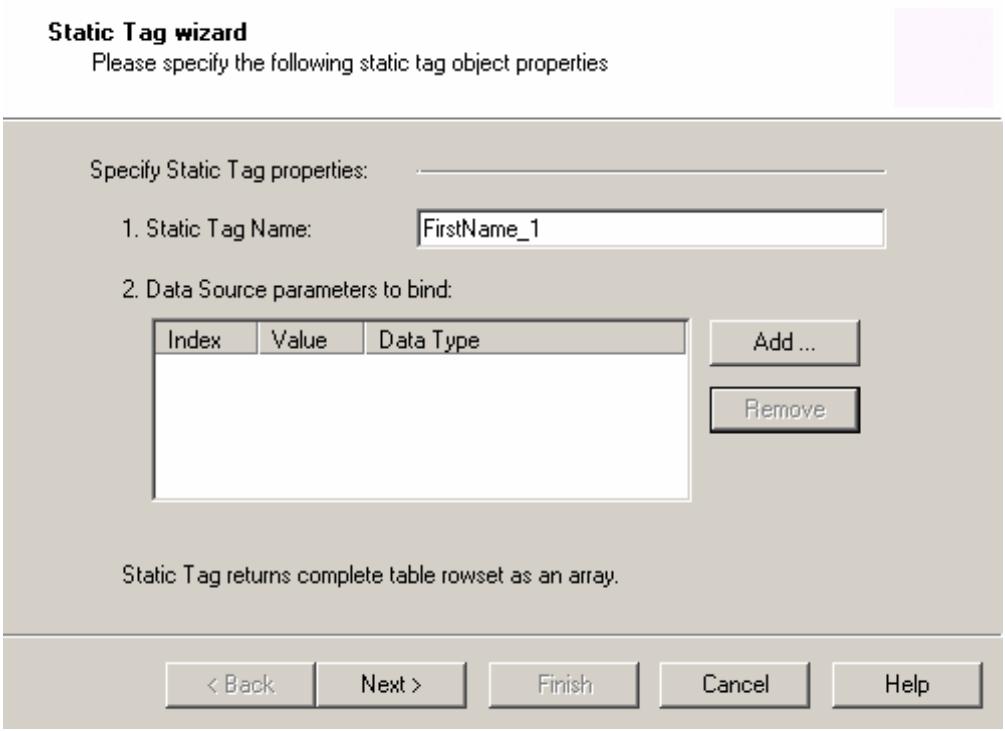
NOTE
You cannot go back after this step.



Data-Mining Wizard: Confirming Data Source Connection

NOTE
For additional information about configuring data items, please see the "Data Item Properties" section later in this document.

1. Now you will define a data item (value) to read from the data source (e.g. the **FirstName** column). Give the data item a name (e.g. **FirstName_1**), as shown in the figure below.



Data-Mining Wizard: Defining a Value to Read

2. Now you need to specify a value to read from the selected column in the database table. The value corresponds to the record number in the database. For example, in the First Name column in the database, record number 1 is the value Nancy.

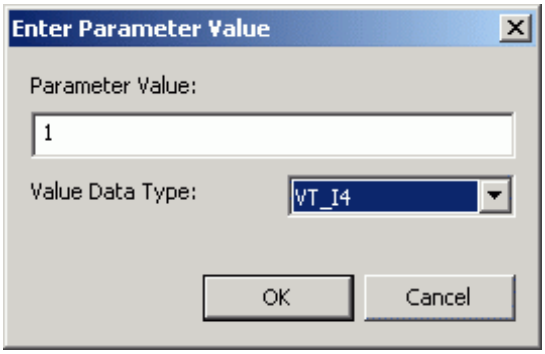
Employees : Table

	Employee ID	Last Name	First Name	Title
▶	1	Davolio	Nancy	Sales Representative
	2	Fuller	Andrew	Vice President, Sales
	3	Leverling	Janet	Sales Representative
	4	Peacock	Margaret	Sales Representative
	5	Buchanan	Steven	Sales Manager
	6	Suyama	Michael	Sales Representative
	7	King	Robert	Sales Representative
	8	Callahan	Laura	Inside Sales Coordinator
	9	Dodsworth	Anne	Sales Representative
*	(AutoNumber)			

Record: 1 of 9

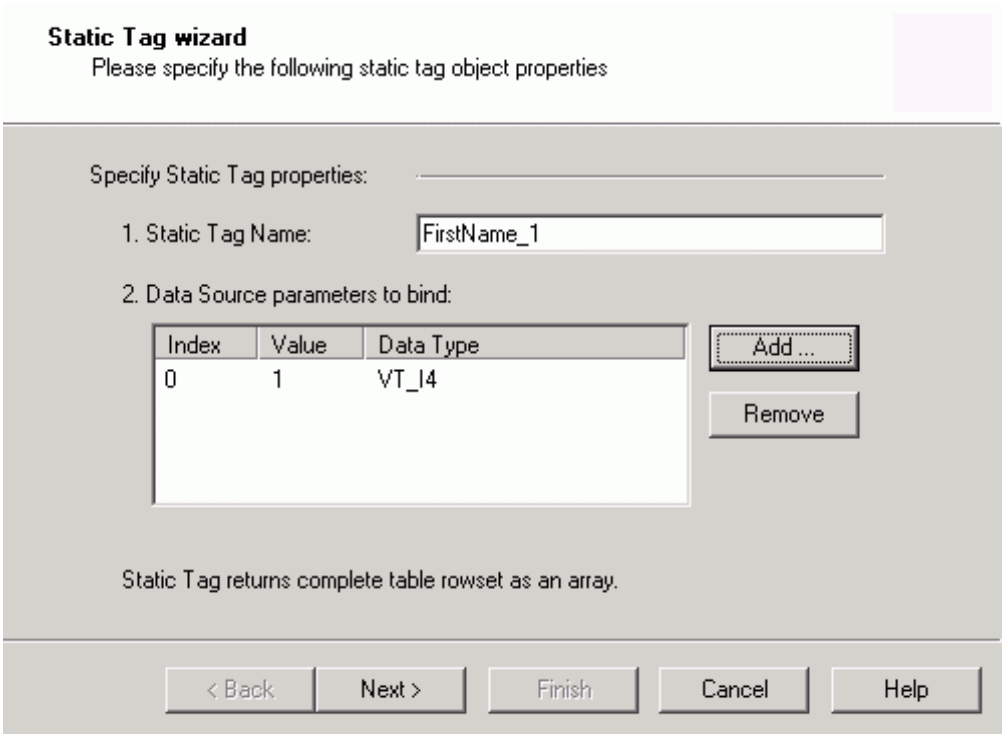
Employees Table in Northwind Database

3. Click the Add button in the Wizard. To read the value Nancy, enter 1 as the Parameter Value, as shown in the figure below.



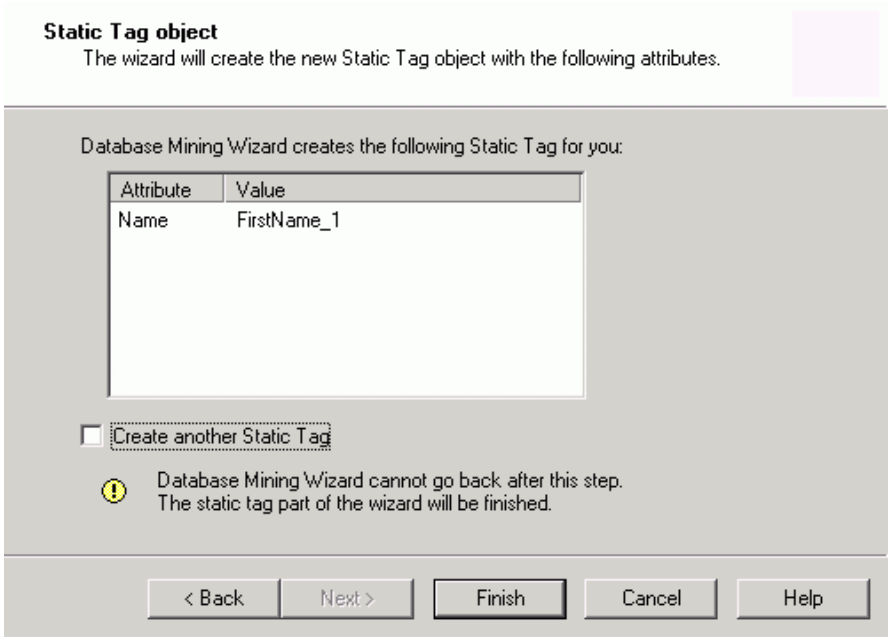
Data-Mining Wizard: Defining a Value to Read

4. The value is added to the parameters to bind section, as shown in the figure below. To read the value Nancy, enter 1 as the Parameter Value, as shown in the figure below.



Data-Mining Wizard: Defining a Value to Read

5. The Wizard displays the data item information that you specified, as shown in the figure below. You have the option of creating additional data items (tags). Click the Finish button to complete the configuration.


Static Tag object
The wizard will create the new Static Tag object with the following attributes.
Database Mining Wizard creates the following Static Tag for you:
Attribute
Value
Name
FirstName_1
Create another Static Tag
Database Mining Wizard cannot go back after this step.
The static tag part of the wizard will be finished.
< Back
Next >
Finish
Cancel
Help

Data-Mining Wizard: Confirming Data Item Value

Toolbar

The Configurator toolbar, shown below, contains the following command buttons. To show or hide the **Standard** toolbar, select **Toolbars > Standard Buttons** from the **View** menu. The **Standard** toolbar, shown below, contains the following command buttons.

New: Creates a new configuration database.

Open: Opens an existing configuration database.

Import: Imports configuration data from a text file (.txt) or a Microsoft Excel file (.csv).

Export: Exports configuration data to a text file (.txt) or a Microsoft Excel file (.csv).

Configuration Wizard: Launches the Data Mining Wizard.

Back: Moves the cursor back to the previously selected item in the tree control.

Next: Moves the cursor to the next item in the tree control.

Up One Level: Moves up one level in the tree control.

Cut: Deletes current selection, sending it to the clipboard.

Copy: Copies the current selection to the clipboard.

Paste: Pastes the current contents of the clipboard.

List: Displays items as a list.

Details: Displays items as a list with details.

Dialog View: Displays additional configuration options.

Global Refresh: Refreshes the data for the entire Configurator screen.

About: Displays information about the application.

Help Topics: Displays help for the selected items.

Menus

The menu bar of the Configurator contains the following menus:

- File
- Edit
- View
- Go
- Tools
- Help

Note: You can also access many of the menu commands by right-clicking items in the tree control of the Configurator and selecting command functions from the pop-up menus.

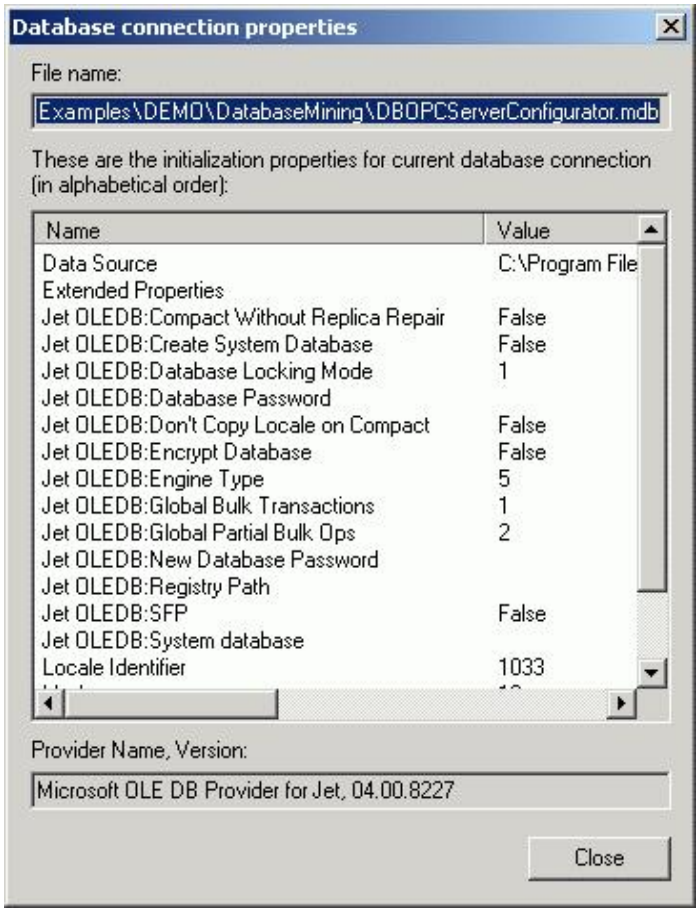
File Menu

The **File** menu commands are listed in the table below.

COMMAND	SHORTCUT KEY	FUNCTION
New	CTRL+N	Creates a new configuration database.
Open	CTRL+O	Opens an existing configuration database.
Save As		Saves the current database under a different name as a Microsoft Access (.mdb) file.
Connection Properties		Displays the current database connection properties.
Configuration Wizard		Launches the Data Mining Wizard.
CSV Export	CTRL+W	Exports configuration data from your database to a text file (.txt) or a Microsoft Excel file (.csv). You can specify the delimiters and what to export.
CSV Import		Imports data into your configuration database from a text file (.txt) or a Microsoft Excel file (.csv). You can then specify the delimiters and choose from the import settings.
XML Export		Exports configuration data to an XML file.
XML Export Schema		Exports configuration data to an XML Schema file.
XML Import		Imports configuration data from an XML file.
XML Validate		This feature does not import an XML data file, but it will try to validate its structure using stored XML schema. Once it passes this validation, the XML file is acceptable for import by the Configurator.
Make Active		Activates the current database. If this command is not available, then the current database is already the active database.
Exit		Closes the application.

Database Connection Properties

Selecting **Connection Properties** from the **File** menu opens the **Database Connection Properties** dialog box, shown below, which lists the initialization properties for the current database connection.

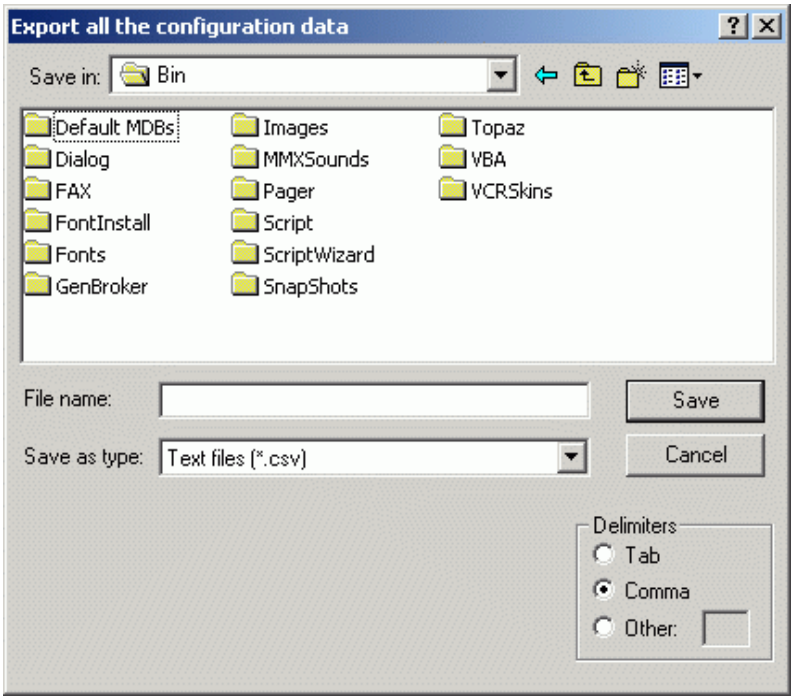


Database Connection Properties Dialog Box

Exporting Configuration Data

Exporting Data to a Text or CSV File

The Configurator offers the flexibility of exporting data from your configuration database to a text (.txt) file or a Microsoft Excel (.csv) file. To export data, select Export from the File menu. This opens the Export Configuration Data to File dialog box, as shown in the figure below. You can then specify the delimiters for exporting the data. Unless you specify delimiters in the Export Configuration Data to File dialog box, the file uses Commas as delimiters by default. Each group contains headings and columns that provide information about each item, such as descriptions and associated translations and expressions. It also provides the "tree" pathway for each item. Choose the directory to which you want to export the data from your database. In the Save As Type field, choose the file type (.txt or .csv) that you would like to save.



Exporting Configuration Data

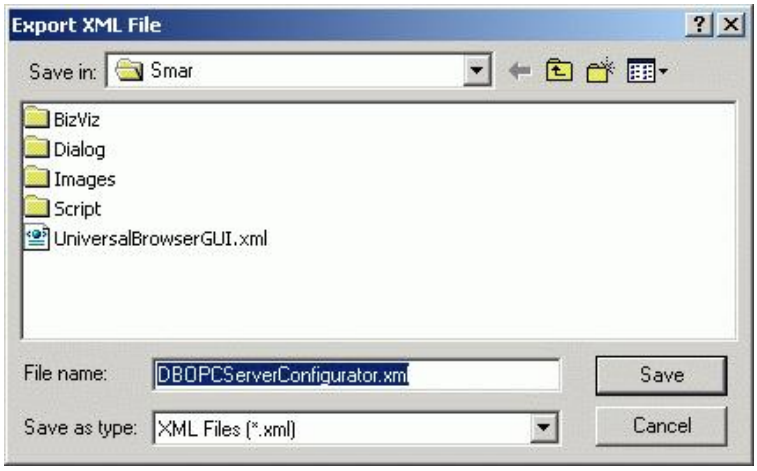
Exporting Data to an XML File

The Configurator also allows you to export data from your configuration database to an XML file. The XML export/import functionality was mainly developed for Windows platforms that do not support databases (e.g. Windows CE and Windows Embedded). XML has the following advantages over the CSV import/export function:

- XML has a standardized format, unlike the text/CSV format, which uses various delimiters (e.g. TAB instead of commas, strings could not accept all characters, etc.)
- XML is language-independent, whereas CSV converts date/time, floats, and currency fields according to local settings in Windows. For example, using CSV, you cannot export data on German Windows and import it on English windows without making changes
- Windows has an installed automation object that has the capability to work with XML. Thus, programmers can create/modify their configurations outside the Configurator using Visual Basic, if desired.
- XML supports schemas. A **schema** is a special XML file that specifies the data structure of an XML data file.

To export data, select **XML Export** from the **File** menu. This opens the **Export XML File** dialog box, as shown in the figure below. Give the file a name, and then choose the directory to which you want to export the data from your database. Click **Save.**

NOTE
You can also export configuration data to an XML Scheme file by selecting **XML Export** from the **File** menu.



Exporting Configuration Data to an XML File

Importing Configuration Data

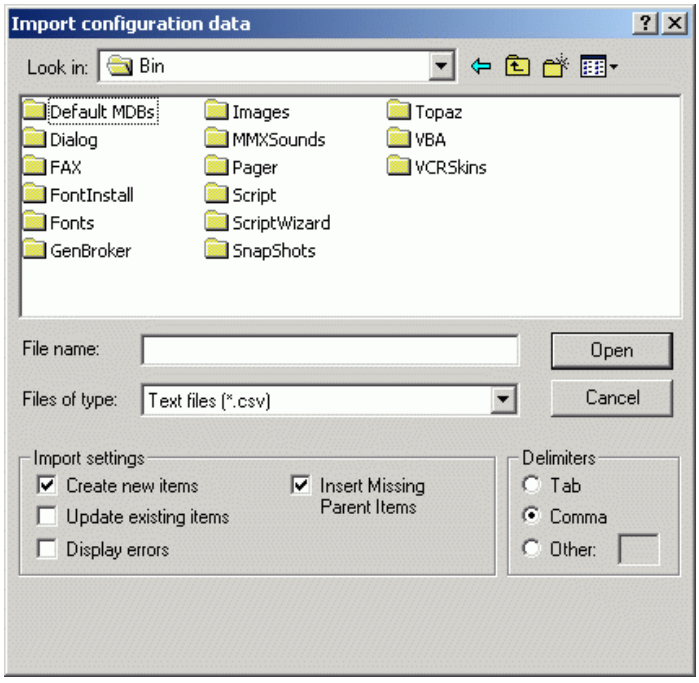
Importing Data From a Text or CSV File

The Configurator offers the flexibility of importing data from a text (.txt) file or a Microsoft Excel (.csv) file to your configuration database. To import data, select Import CSV from the File menu. This opens the Import Configuration Data From File dialog box, shown below. You can then specify the delimiters and choose from the following import settings:

- **Create new items.** When the import file contains items that are not yet in the configuration database, then it creates them. Otherwise it skips these items.
- **Update existing items.** When the import file contains items that are in the configuration database, then it updates them using data from the import file. Otherwise it skips these items.

NOTE
Either **Create new items** or **Update existing items** must be selected. Otherwise there is nothing to import.

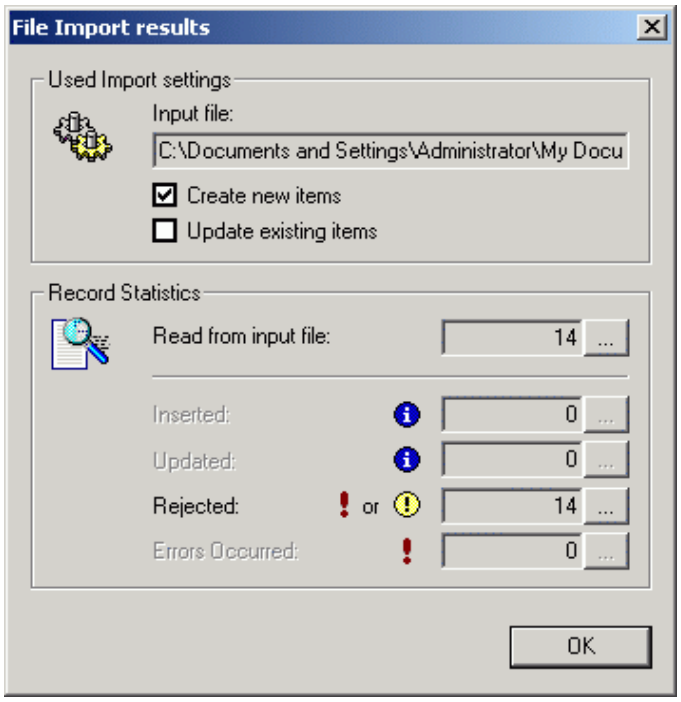
- **Display errors.** When this item is checked, the Configurator shows a dialog box if an error occurs, and then asks you if you want to proceed with the import. When it is not checked, it skips all items where an error occurred.



Importing Configuration Data

When you have selected a file to import, click **Open.** When the import is completed, the **File Import Results** dialog box opens, as shown below. This shows the import settings, including the input file name. It also provides a summary of the import, including how many items were inserted, updated, or rejected, and shows how many errors occurred.

Click the **...** button to the right of each field to get the details view of the import results, as shown below. This view shows the specific items that were inserted, updated, or rejected, as well as a description of any errors that occurred.



File Import Results Dialog Box

Importing Data From an XML File

The Configurator allows you to import data from your configuration database to an XML file. The XML export/import functionality was mainly developed for Windows platforms that do not support databases (e.g. Windows CE and Windows Embedded). XML has the following advantages over the CSV import/export function:

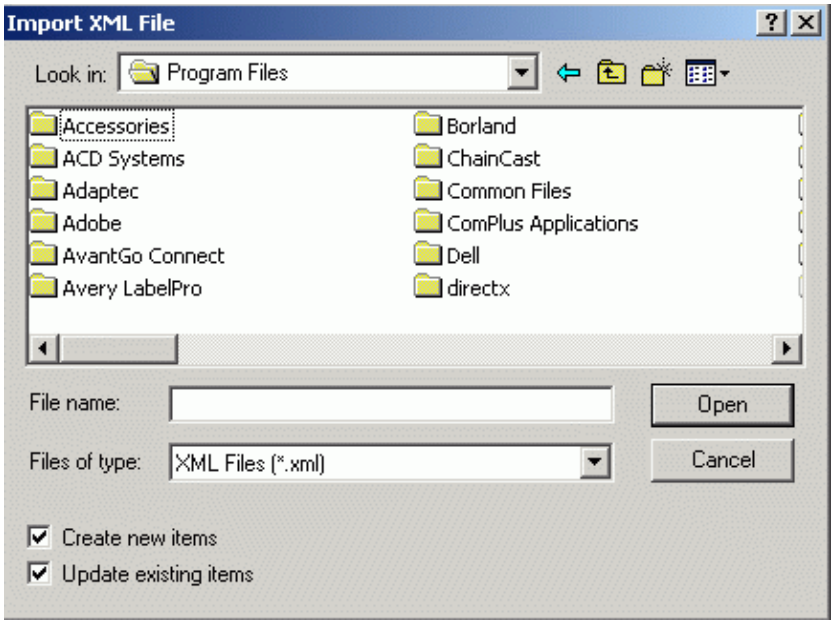
- XML has a standardized format, unlike the text/CSV format, which uses various delimiters (e.g. TAB instead of commas, strings could not accept all characters, etc.)
- XML is language-independent, whereas CSV converts date/time, floats, and currency fields according to local settings in Windows. For example, using CSV, you cannot export data on German Windows and import it on English windows without making changes
- Windows has an installed automation object that has the capability to work with XML. Thus, programmers can create/modify their configurations outside the Configurator using Visual Basic, if desired.
- XML supports schemas. A **schema** is a special XML file that specifies the data structure of an XML data file.

To import data, select **XML Import** from the **File** menu. This opens the **Import XML File** dialog box, as shown in the figure below. Give the file a name, and then choose the directory from which you want to import the data. You can then specify the delimiters and choose from the following import settings. Click **Open.**

- Create new items. When the import file contains items that are not yet in the configuration database, then it creates them. Otherwise it skips these items.
- Update existing items. When the import file contains items that are in the configuration database, then it updates them using data from the import file. Otherwise it skips these items.

NOTE
Either **Create new items** or **Update existing items** must be selected. Otherwise there is nothing to import.

NOTE
Selecting **XML Validate** from the **File** menu does not import an XML data file, but it will try to validate its structure using stored XML schema. Once it passes this validation, the XML file is acceptable for import by the Configurator.

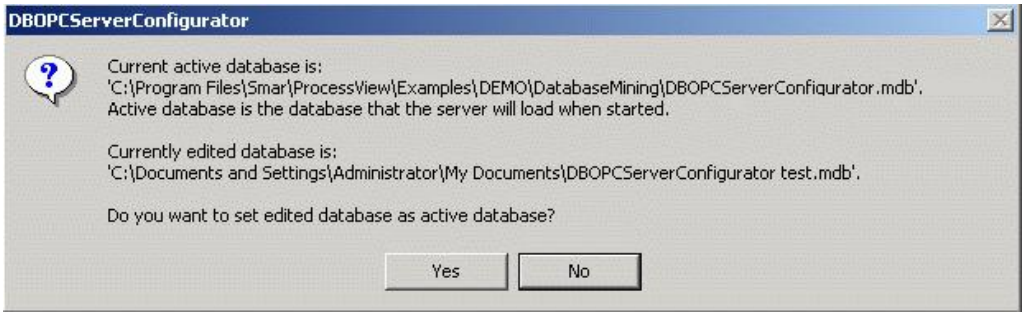


Importing Configuration Data From an XML File

Activating the Database

Once your configuration is complete, you need to make sure that it is the active database. The database that is currently active is the one that the server uses. To make the current database active, select **Make Active…** from the **File** menu. If the **Make Active…** selection is grayed out, then the current database is already the active database.

A dialog box appears showing both the current active database and database that is currently being edited, as shown in the figure below. To set the edited database as the active database, click the **Yes** button.


DBOPCServerConfigurator
Current active database is:
'C:\Program Files\Smar\ProcessView\Examples\DEMO\DatabaseMining\DBOPCServerConfigurator.mdb'.
Active database is the database that the server will load when started.
Currently edited database is:
'C:\Documents and Settings\Administrator\My Documents\DBOPCServerConfigurator test.mdb'.
Do you want to set edited database as active database?
Yes
No

Activating the Database

Edit Menu

The **Edit** menu commands are listed in the table below.

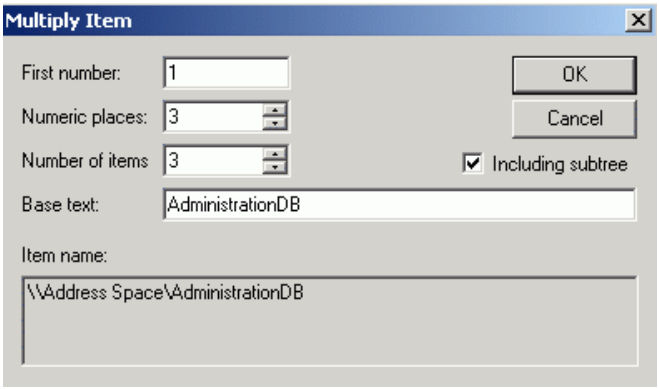
Edit Menu Commands

COMMAND	SHORTCUT KEYS	FUNCTION
New		Creates a new item depending on what is selected in the tree control.
Rename	CTRL+R	Renames the selected item.
Multiply	CTRL+M	Opens the **Multiply Item** dialog box, which allows you to multiply an item in the tree control.
Delete	CTRL+DEL	Deletes the selected object.
Cut	CTRL+X	Cuts the selected object from the view and places it on the clipboard.
Copy	CTRL+C	Copies the selected object to the clipboard.
Paste	CTRL+V	Pastes the last object placed on the clipboard.
Select All	CTRL+A	Selects all objects in a list. The selection is shown in the upper-right-hand section of the viewer.
Invert Selection		Unselects all selected items and selects all unselected items in a list in the upper-right-hand section of the viewer.

Multiplying Items

The Configurator allows you to multiply items in the tree control. Multiplication provides a simple way of developing configurations where there are many similar items in a given category. To multiply an item:

1. Select the item in the tree control that you wish to multiply.
2. Either right-click the item and select **Multiply** from the pop-up menu, or select **Multiply** from the **Edit** menu. This opens the **Multiply Item** dialog box, shown below.



Multiply Item Dialog Box

3. When the items are multiplied, they are all given a base name followed by a number. The default base text is the name of the item selected for multiplication. To modify the base text, change the **Base Text** field appropriately.
4. In the **First Number** field, specify the number to appear next to the first multiplied item.
5. In the **Number of Items** field, specify how many items you wish to create.
6. In the **Numeric Places** field, specify the minimum length of each number to append. Values that take up less space than the specified amount of numeric places will have zeros before the number.
7. If you want to multiply all subfolders as well, check the **Including Subtree** check box.
8. Click the **OK** button to do the multiplication. The example configuration shown in the **Multiply Item** dialog box above creates three new items with the following names:

- AdministrationDB001
- AdministrationDB002
- AdministrationDB003

All subfolders will also be multiplied.

View Menu

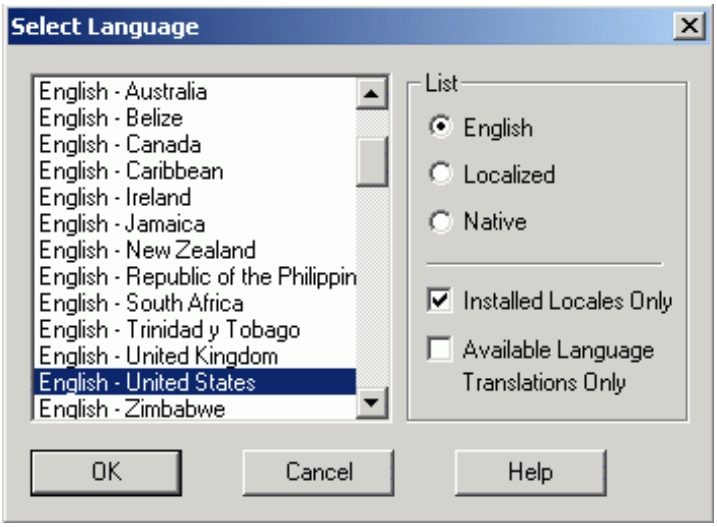
The **View** menu commands are listed in the table below.

View Menu Commands

COMMAND	SHORTCUT KEYS	FUNCTION
Toolbar		Toggles the toolbar.
Status Bar		Toggles the status bar.
List	F9	Displays items as a list.
Details	F10	Displays items as a list along with detailed information about the configuration of each item.
Dialog View	F11	Toggles the configuration window (right-hand pane).
Sort By		Displays a list of options for sorting the columns in the right-hand pane of the screen. The options listed depend on the level within the view.
Show/Hide Columns		Displays a list of options that you can choose to show or hide in the view.
Select Language		Opens the **Select Language** dialog box (see below). Choose the language you wish to use for your system (Unicode version only) and click **OK.** For navigation purposes, use the buttons and check boxes in the **List** section.
Global Refresh	F5	Refreshes the data for the entire Configurator screen.
Subtree Refresh	CTRL+F5	Refreshes only the data contained in the currently selected subtree.

Selecting Languages
The Select Language function on the View menu allows you to choose which language to use in your display. Choosing Select Language from the View menu opens the Select Language dialog box, shown in the figure below.

NOTE
A language resource .dll is required for language switching.



Select Language Dialog Box

Define the parameters listed in the table below. Then click OK to return to the work area.

Select Language Parameters

PARAMETER	DESCRIPTION
List	Lists available languages. Depending on which item you have selected, the view on the left will change. If **English** is checked, the languages will appear as their English name. If **Localized** is checked, the languages will appear with the native country in parentheses (for languages with several dialects only). When **Native** is checked, the languages are displayed the way they would be written in that language.
Installed Locales Only	If this is checked, local languages appear in the box.
Available Language Translations Only	Checking this box allows you to choose from available language translations only.

Go Menu

The **Go** menu commands are listed in the table below.

Go Menu Commands

COMMAND	SHORTCUT KEYS	FUNCTION
Back	CTRL+ALT+ Left Arrow	Moves the cursor back to the previously selected item in the tree control.
Forward	CTRL+ALT+ Right Arrow	Moves the cursor forward to the previously selected item in the tree control.
Up One Level		Moves the cursor up one level in the tree control.
Next Item	ALT+Down Arrow	Moves the cursor to the next item down in the tree control.
Previous Item	ALT+Up Arrow	Moves the cursor to the next item up in the tree view.
Expand Item	ALT+Left Arrow	Expands an item that contains a submenu.
Collapse Item	ALT+Right Arrow	Collapses an item that contains a submenu.
Page Up	ALT+PgUp	Moves the cursor up to the first item in the tree.
Page Down	ALT+PgDown	Moves the cursor down to the last visible item in the tree.
Home	ALT+Home	Moves the cursor up to the first item in the tree.
End	ALT+End	Moves the cursor down to the last visible item in the tree.
Next Pane	F6	Moves the cursor to the next pane.
Previous Pane	SHIFT+F6	Moves the cursor to the last pane used.

Tools Menu

The **Tools** menu commands are listed in the table below.

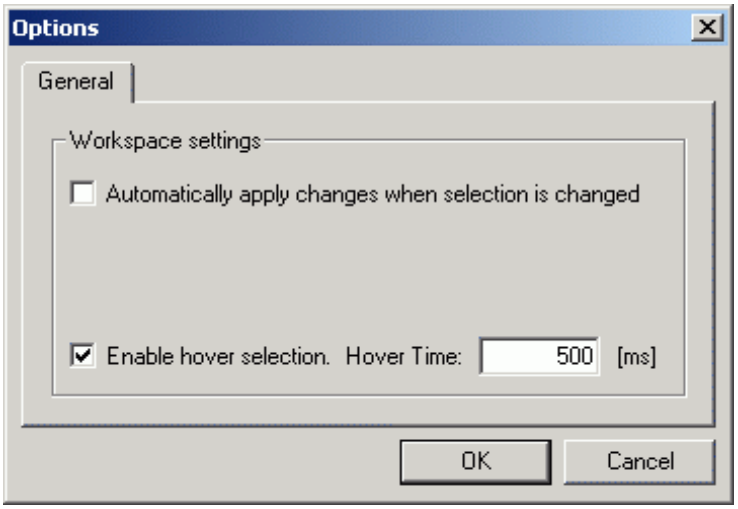
Tools Menu Commands

COMMAND	FUNCTION
Options	Launches the **Options** dialog box.
Compact/Repair MS Access Database	Opens the **Compact/Repair MS Access Database** dialog box.

Options

To choose additional settings, select **Options** from the **Tools** menu. This opens the **Options** dialog box, as shown in the figure below. The **General** tab of the **Options** dialog box contains the following options:

- **Automatically apply changes when selection is changed:** Checking this option allows changes to the configuration database to be saved each time you switch dialogs without clicking on the **Apply** button or being shown a message asking if you would like to apply changes.
- **Enable hover selection:** Checking this option allows you to highlight an item by moving the mouse pointer over that item and keeping it there for a specified amount of time (in milliseconds).

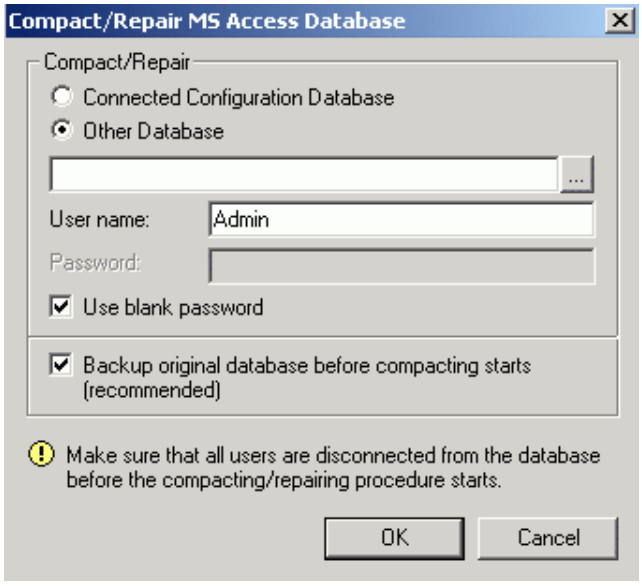


Options Dialog Box: General Tab

Compacting and Repairing Microsoft Access Databases

You can compact Microsoft Access databases, which can be either configuration databases or historical databases, using the **Compact/Repair MS Access Database** dialog box, shown in the figure below. To open this dialog box, select **Compact/Repair MS Access Database** from the **Tools** menu. Microsoft Access-based databases are subject to database fragmentation over time, and the support for the database will compact the target database, reclaim unused space, and drastically improve database performance.

NOTE
It is critical that no users or client applications are connected to the database at the time of compacting and that, if the **Backup Original Database** option is selected, there is plenty of available hard disk space.



Compacting and Repairing Microsoft Access Databases

Help Menu

The **Help** menu commands are listed in the table below.

COMMAND	SHORTCUT KEY	FUNCTION
Help Topics	F1	Launches the online Help for the Configurator.
About Application		Launches the About Box, which contains information about the product version number, copyright, and available disk space. It also contains contact information.

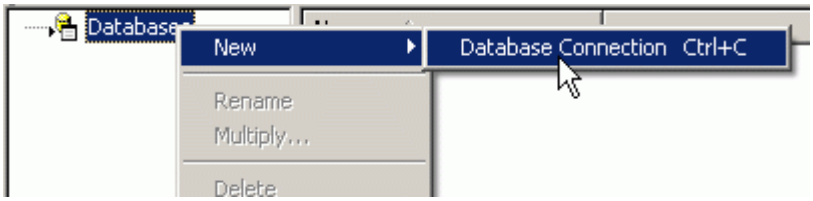
Database Connections

The first step in data-mining configuration is to connect to a database (i.e. where to get the data). The **Databases** tree control is where you configure your connections to different types of databases, including Microsoft Access, Microsoft SQL Server, Microsoft Excel, Oracle and other ODBC data sources. The Database Connection object is equivalent to a physical database connection. To correctly configure database connection, you need to specify a database type and fill in the appropriate number of connection parameters.

Creating a New Database Connection

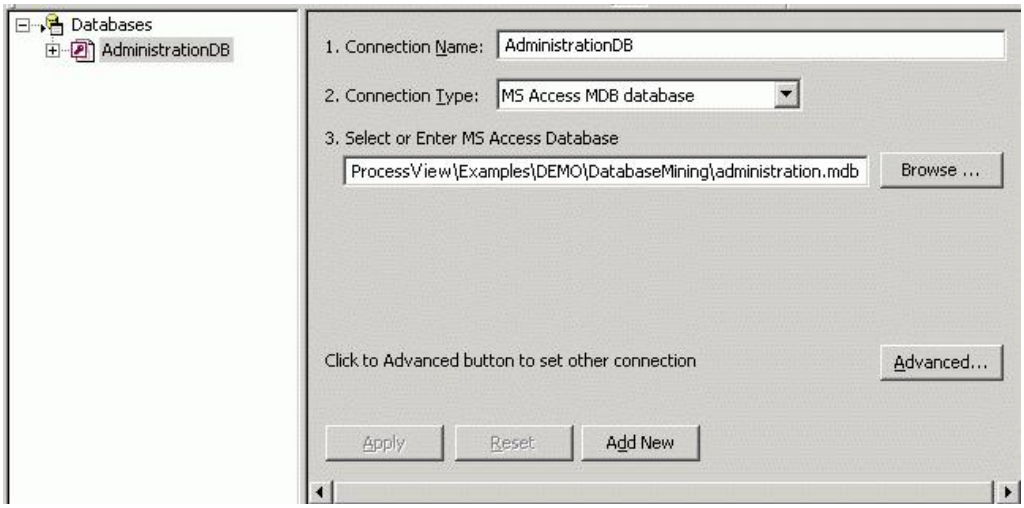
To create a new database connection:

1. Right-click on the **Databases** tree control of the Configurator and select **New > Database Connection** from the pop-up menu, as shown in the figure below.



Creating a New Database Connection

2. The properties dialog box for the new database connection appears in the right-hand pane of the Configurator, as shown in the figure below.



Setting the Properties for the New Database Connection

3. In the **Connection Name** field, type a name for the new connection.

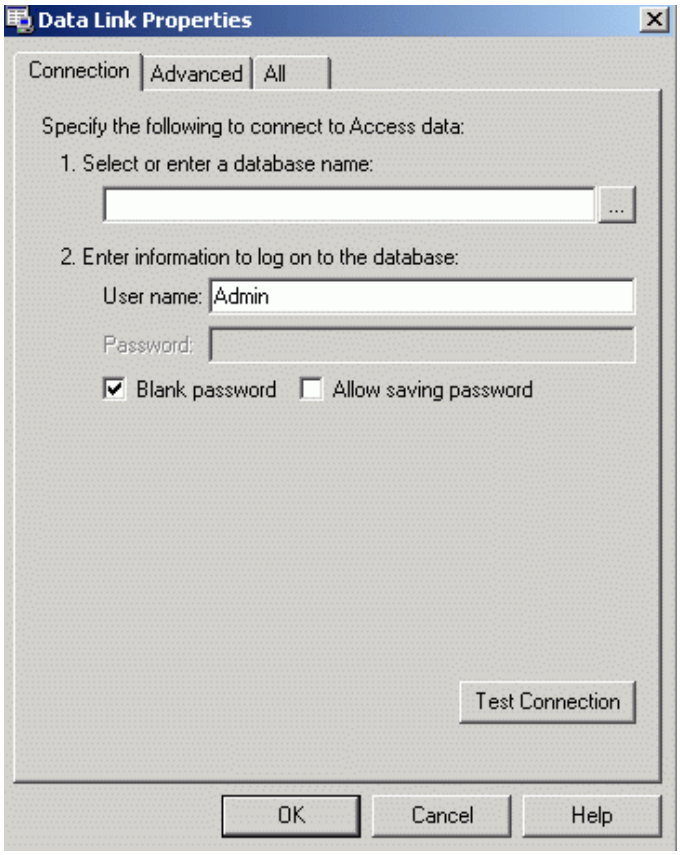
4. Select a **Connection Type** from the drop-down list (Microsoft Access, Microsoft SQL Server, Microsoft Excel, Oracle, or another ODBC data source).
5. Specify the database or data source to which you want to connect.
6. When you have finished configuring the database connection properties, click the **Apply** button. The new connection appears under the **Databases** tree control.

Database Connection Properties

Establishing a database connection requires the following basic steps, as shown in the figures below:

7. In the Connection Name field, type a name for the new connection
8. Select a Connection Type from the drop-down list (Microsoft Access, Microsoft SQL Server, Microsoft Excel, Oracle, or another ODBC data source).
9. Specify the database or data source to which you want to connect.
10. Click the Apply button to save your settings.

NOTE
You can also click the **Advanced** button to establish database connections through the Windows **Data Link Properties** dialog box, as shown in the figure below.



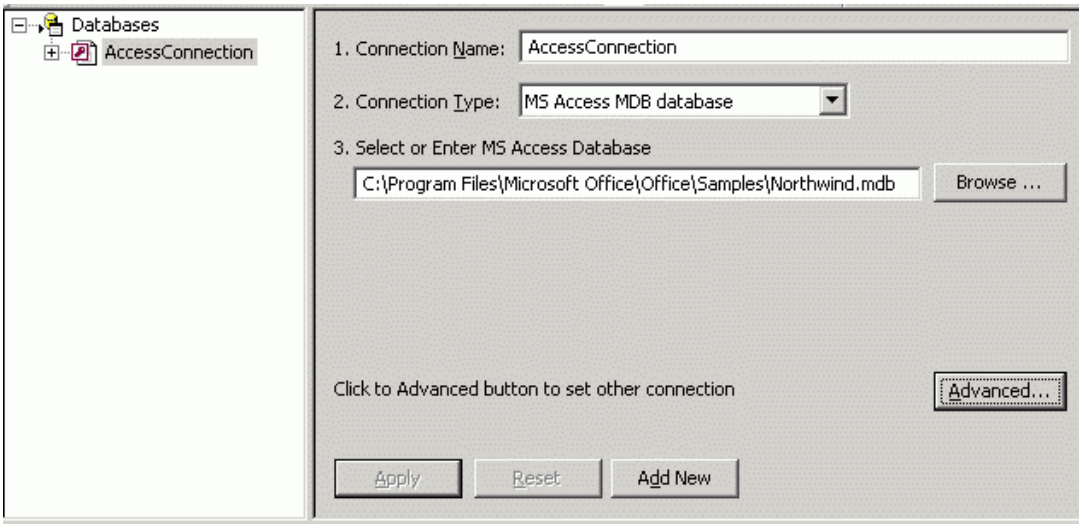
Connecting to Data Source Through the Data Link Properties

The database connection properties vary slightly with each connection type:

- Microsoft Access Connection
- Microsoft Excel Connection
- Microsoft SQL Server Connection
- Oracle Connection
- ODBC Connection

Microsoft Access Connection

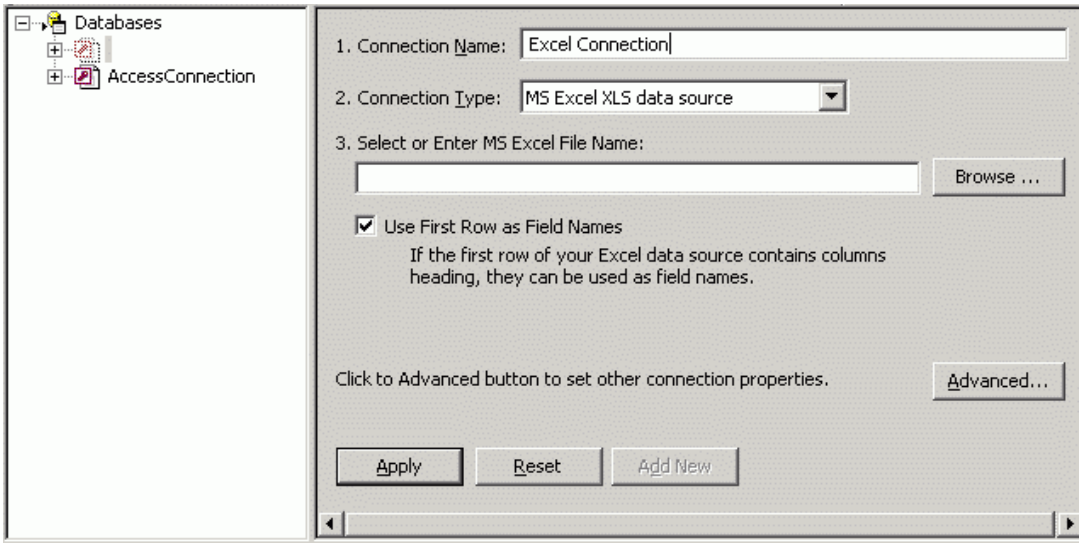
In the Microsoft Access connection properties, click the Browse button and select an Access (.mdb) file, as shown in the figure below.



Database Connection Properties: Microsoft Access Connection

Microsoft Excel Connection

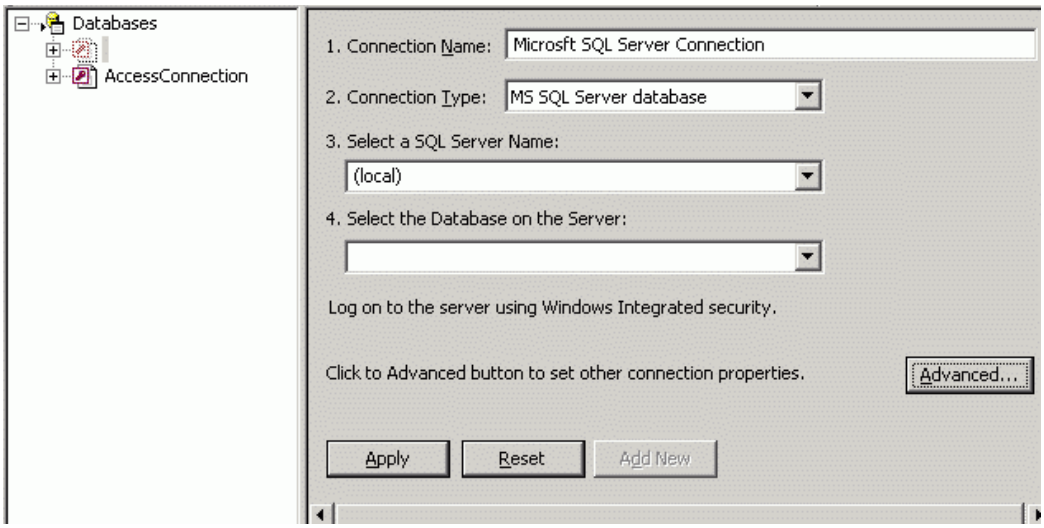
In the Microsoft Excel connection properties, click the Browse button and select an Excel (.xls) file, as shown in the figure below. If the first row of your Excel data source (e.g. spreadsheet) contains column headings, you can choose to use the column headings as field names by checking the Use First Row as Field Names check box, as shown in the figure below.


Databases
AccessConnection
1. Connection Name:
Excel Connection
2. Connection Type:
MS Excel XLS data source
3. Select or Enter MS Excel File Name:
Browse ...
Use First Row as Field Names
If the first row of your Excel data source contains columns heading, they can be used as field names.
Click to Advanced button to set other connection properties.
Advanced...
Apply
Reset
Add New

Database Connection Properties: Microsoft Excel Connection

Microsoft SQL Server Connection

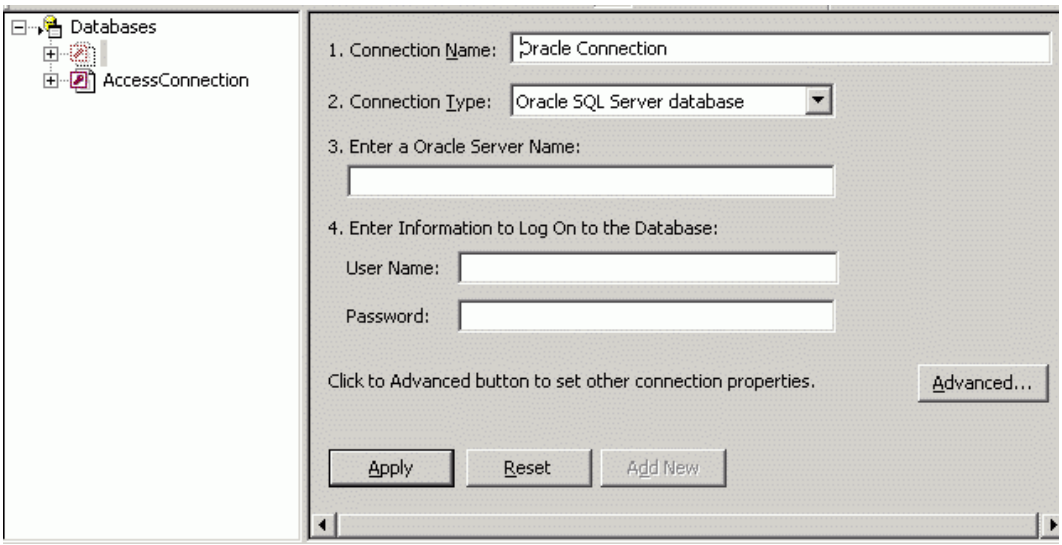
In the Microsoft SQL Server connection properties, select a SQL Server from the drop-down list. The default SQL server is "(local)." Then select the database on the specified SQL Server file, as shown in the figure below. By default, SQL Server database connections use Windows integrated security.



Database Connection Properties: Microsoft SQL Server Connection

Oracle Connection

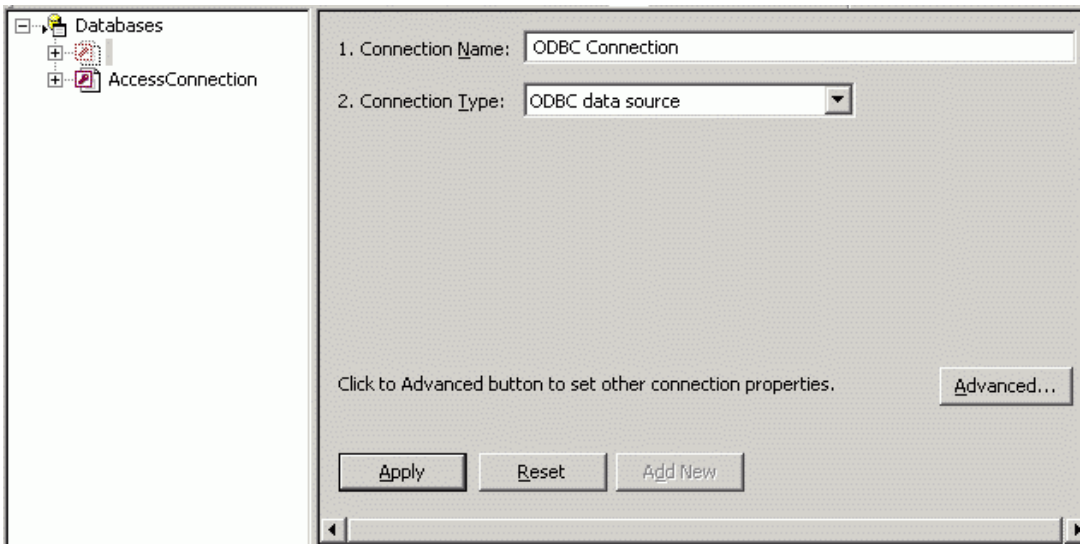
In the Oracle connection properties, specify an Oracle database name. Then supply the **User Name** and **Password** required to log on to the specified Oracle database, as shown in the figure below.



Database Connection Properties: Oracle Connection

ODBC Connection

An ODBC connection, shown in the figure below, is a connection to a generic, open data source. Click the **Advanced** button to establish database connections through the Windows **Data Link Properties** dialog box.



Database Connection Properties: ODBC Connection

Data Sources and Data Manipulators

Once you have established a connection to a database, the next step is to select a data source or data manipulator to mine within the connected database (i.e. which group of data within the connected database). Data sources and data manipulators work with the data stored in databases via read/write operations.

Data Sources

A **data source** can be use to read data from a database. Every data source is connected to particular database connection. Data sources are designed to periodically read database tables and display them in an OPC Data Access client. A data source supports two different ways to read data from a database:

- Direct access to database table (view)
- SQL *read* command based on SELECT statement

Data Manipulators

A **data manipulator**, which is intended for processing data stored in a connected database, manipulates data using a SQL *write* command or by executing a stored procedure. Every data manipulator is connected to particular database connection. Data manipulator objects are designed to manipulate database data and structure using stored procedures or simple SQL commands when the database server or engine does not support stored procedures. In comparison with data sources, a data manipulator should not return any cursor variables (row sets). Data manipulation actions are executed upon user request only (there is no polling mechanism).

NOTE
SQL queries in a data manipulator object should be used only for databases that do not support stored procedures (e.g. Excel, MS Jet). In all other cases, stored procedures/functions should be used to manipulate database data. The reason for this is that stored procedures offer wider functionality, and because they are precompiled on the server, execution is much faster.

Do's and Don'ts for Data Mining

Do not use:

- Stored procedures in data manipulators with Microsoft Access databases.

- Spaces in stored procedures names.
- CREATE, INSERT, UPDATE statements in data source SQL command.
- Data manipulator stored procedures to view data.

Do use:

- Stored procedures in data manipulators with Microsoft SQL and Oracle.
- SQL queries when connecting to Microsoft Excel or Microsoft Jet connections.
- Data manipulator stored procedures to manipulate data only.

Troubleshooting Data Sources and Data Manipulators

When I select 'SQL Command' under Data Source, what should it do?
SQL command will behave similarly to a table-based data source; it will send data from a record set returned by this command. You can parameterize it using data item parameters.
When I select enable 'Multi-rows Dataset,' what should it do (what should I expect as the result)?
You will get multiple rows from a SQL query or table. In the case of a single column, it will return a single-dimensional array of values where each value represents one row. When you use @@Recordset, then you will get a two-dimensional array (like table content) - all columns and rows.
Note: One limitation is that 'Multi-rows Datasets' is read-only.

What are SQL Command parameters, and why should I provide more than one of these?
SQL command parameters specify a set of parameters used by a SQL command; the SQL command can use more than one parameter.

Why and when should I give more than one table parameter?
You may want to locate a table row using different criteria (e.g. if you have an "Employees" table, you can index it using "name, mid-name, surname," or you can use "personal ID."
When should I check 'Enable Writes'? How are the writes possible (for example, from GraphWorX)?
If you will use a table-based data source with a single-row as output, then every column-oriented data item will return a single value. In this case, you can request it as a process point and modify it.

After I check 'Enable Writes', when should I check 'Enable Inserts'?
In case the related table row is missing from the table; then after writing it will create this table row using a combination of known parameters and database default values.

What is a data manipulator?
A data manipulator object allows you to execute stored procedures or stand-alone SQL queries and get results from them (if there are any). There are two special data items to manipulate it:

- @@Execute
- @@Results

You can execute stored procedures by writing into the @@**Execute** data item, where the value should be a safe array of VARIANT values. The first value is "request identification," and the rest of the values are input parameters for this procedure. You will get results from @@**Result** data item. The values have a structure similar to the execute data item. It is again an array of VARIANT values where the very first value is the "request identification" and the rest of the values are output parameters.

What does 'Bind Results' for SQL Command do, and why is the 'Edit' button available? What should I be able to do with this button?
The **SQL Command** section in the data manipulator configuration was designed for databases (such as Microsoft Access) that do not have stored procedures support implemented (or have very poor support). Then the only way to manipulate the data is to use SQL commands. One command is used to do specific action, and a resulting SQL command is used to get output values in the same database transaction. For example, when you insert a new table row into a Microsoft Access database, you can then read an auto-generated value from the table using the **SELECT @@identity** command. Another example is if you will insert/update something; then you can get back a sum of certain column(s). The range of its use is very wide and depends on specific implementation.

Where should stored procedures be written? (For example if I connect to SQL Server, should

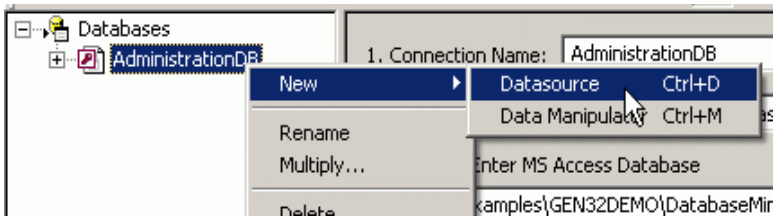
the stored procedure be written in SQL and already available for us to use it?)
Stored procedures are stored in the database server and allow you to manipulate database content. They are usually faster than using SQL commands from the client side. To get more information, you will need to study the documentation for the specific database server.

What should I expect when I check 'Complete Rowset'?
When you check the **Complete Rowset (returned as an array)** check box, it will return a single row of data (all columns) in a single-dimensional array. When "Enable Multi-rows Dataset" is checked, you will get a multi-dimensional array as a result (similar to the @@**Recordset** data item).

Creating a New Data Source

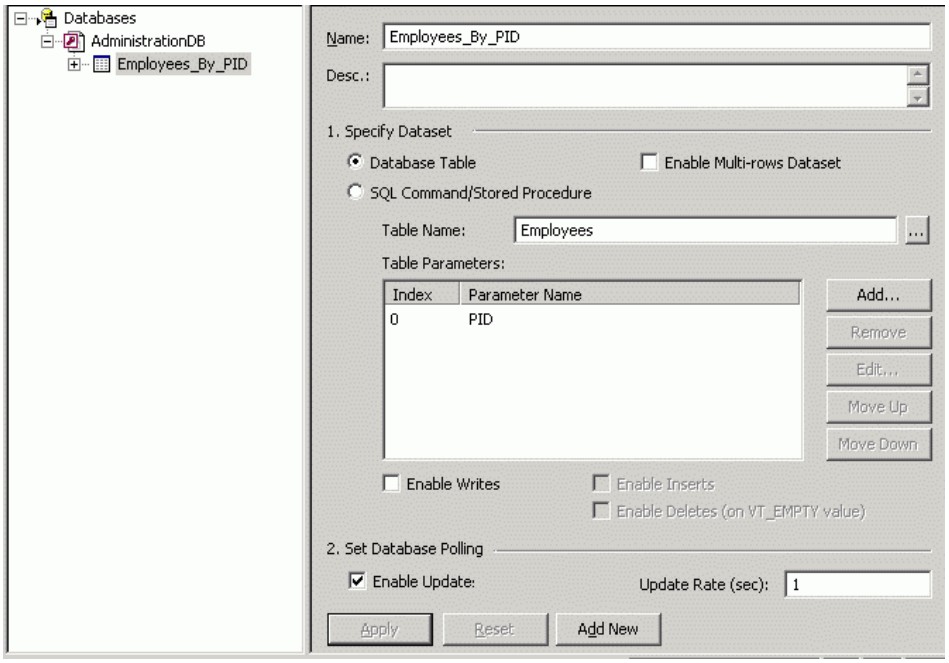
To create a new data source:

1. Right-click on a database connection in the tree control of the Configurator and select **New > Data Source** from the pop-up menu, as shown in the figure below.



Creating a New Data Source

2. The properties dialog box for the new data source appears in the right-hand pane of the Configurator, as shown in the figure below.



Setting the Properties for the New Data Source

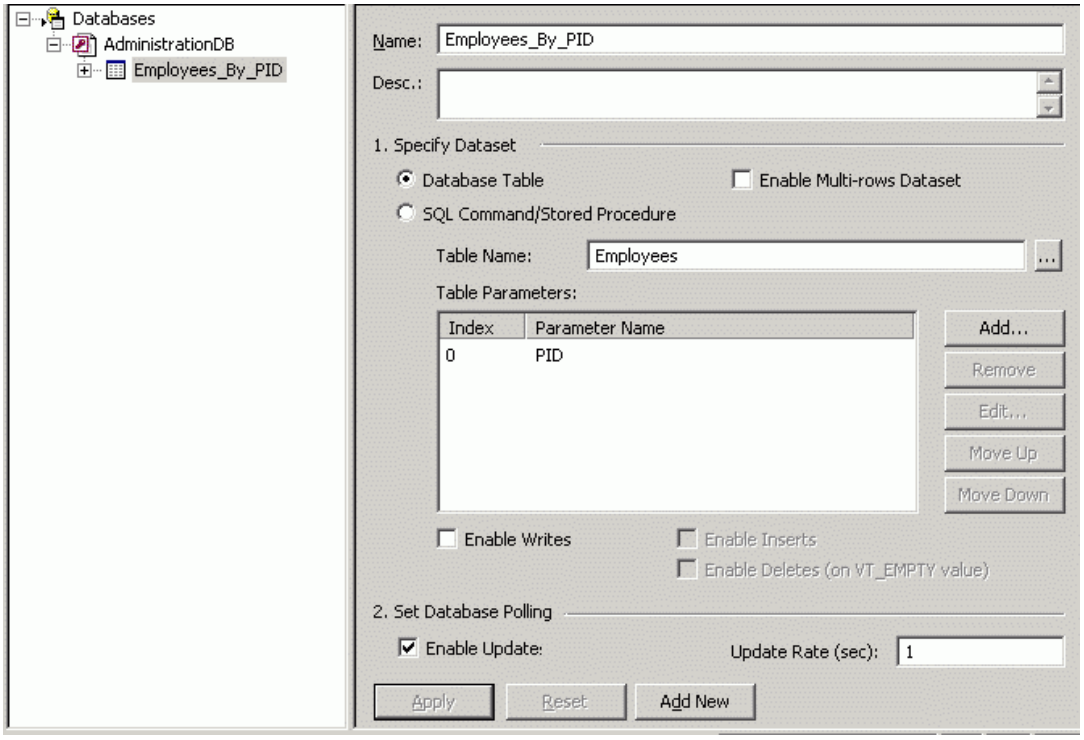
3. In the Name field, type a name for the new data source.
4. Specify a Data Set (Database Table or SQL Command/Stored Procedure) to mine within the connected database.
5. Specify an Update Rate (in seconds) to poll for updates from the database.

6. When you have finished configuring the data source properties, click the Apply button. The new data source appears under the database connection in the tree control.

Data Source Properties

A **data source** can be use to read data from a database. It can access a specific database table directly or use a SQL *read* command to get data. Configuring a data source requires the following basic steps, as shown in the figures below:

7. In the Name field, type a name for the new data source.
8. Specify a Data Set (Database Table or SQL Command) to mine within the connected database.
9. Database polling properties should be specified for any data source object. Specify an Update Rate (in seconds) to poll for updates from the database. The Enable Update check box must also be checked in order to specify an updated rate. When updates are disabled, then the data mining server scans the database only once when the first data item is requested or on the user request invoked by refreshing the data item.
10. When you have finished configuring the data source properties, click the Apply button. The new data source appears under the database connection in the tree control.



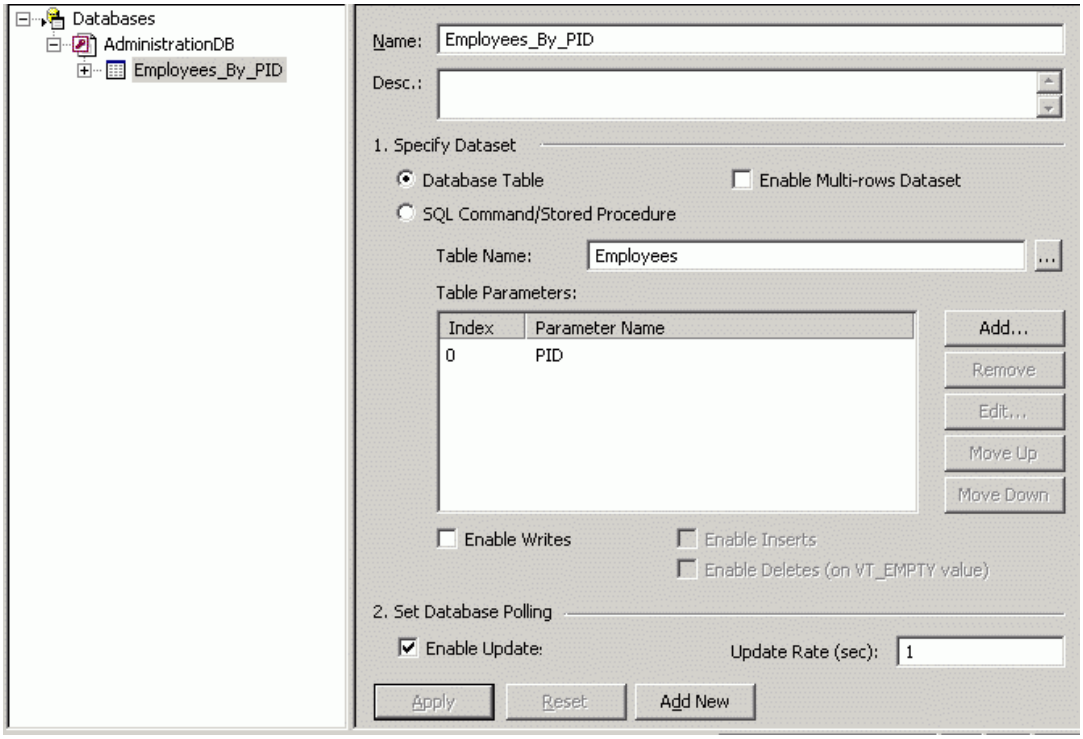
Data Source Properties

Database Tables

To configure a data source object with direct table access, you must fill in the fully qualified database table name (or view). To locate specific table row(s), table parameters can be used. **Parameters** define a subset of table columns used together as a filter for returned table row(s). Parameter values are specified by data items.

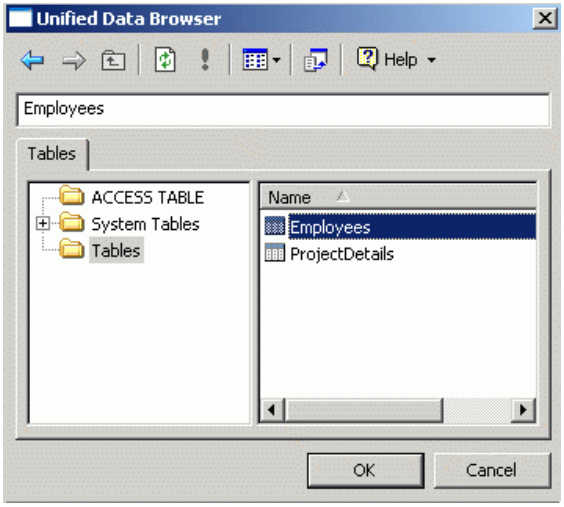
To get data from a specific table in the database:

11. Select the Database Table option under the Specify Data Set section, as shown in the figure below.



Data Source Properties: Database Table

1. In the Table Name field, click the … button. This opens the Unified Data Browser, which lists all the tables in the database, as shown in the figure below. Select a table (e.g. "Employees"), and then click OK.

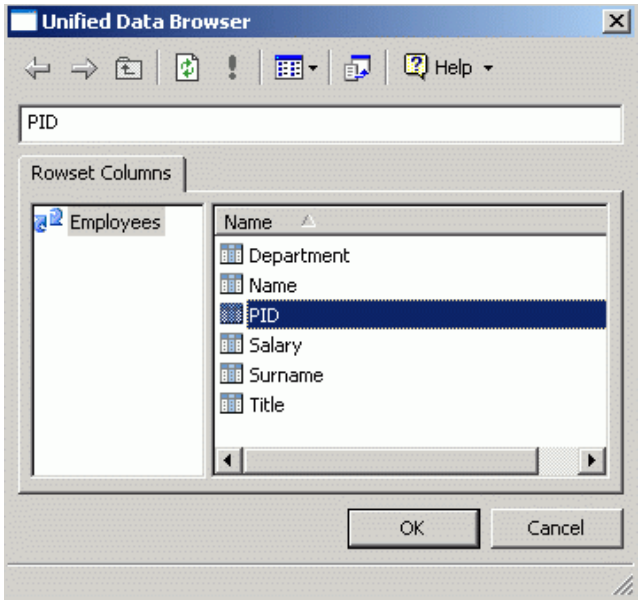


Selecting a Database Table

1. In the Table Parameters field, click the Add button. This opens the Unified Data Browser, which lists all columns in the selected table. Select the desired columns from the specified table as shown in the figure below, and then clickf OK.

NOTE
If you want to read more than one row from the selected database table, check the Enable Multi-rows Dataset check box. This way you do not need to add individual rows to the Table Parameters field.

NOTE
You can also change the column ordering in the data source configuration by selecting a column and clicking the **Move Up** or **Move Down** buttons. Click the **Remove** button to delete the selected column(s).



Selecting a Database Column

Enable Writes
Direct database access allows users to make modifications in the specified database table (may work for views with limitations given by the connected database server or engine). When the Enable Writes check box is checked, you can write a value to OPC tags and it will update related records in the database table. This works for table-based data sources only.
Note: Writes are disabled for multi-row datasets.

Enable Inserts
The Enable Inserts check box is available only when the Enable Writes check box is checked. In case the record is missing in the database table (data tags return VT_EMPTY and Bad quality) then writing to this tag will create a new record in the database table. Since the table may have more columns than just the one requested in the data tag, it uses the following criteria to fill in other values:

- It uses tag parameters and the actual value to create the record; the rest of the columns use database defaults.
- If the data tag is record-based, then it uses all the values passed during the write.

Enable Deletes
The Enable Deletes (on VT_EMPTY value) check box is available only when the Enable Writes check box is checked. It works for record-based data tags only. If you write VT_EMPTY value, then it will delete related records from the database table.

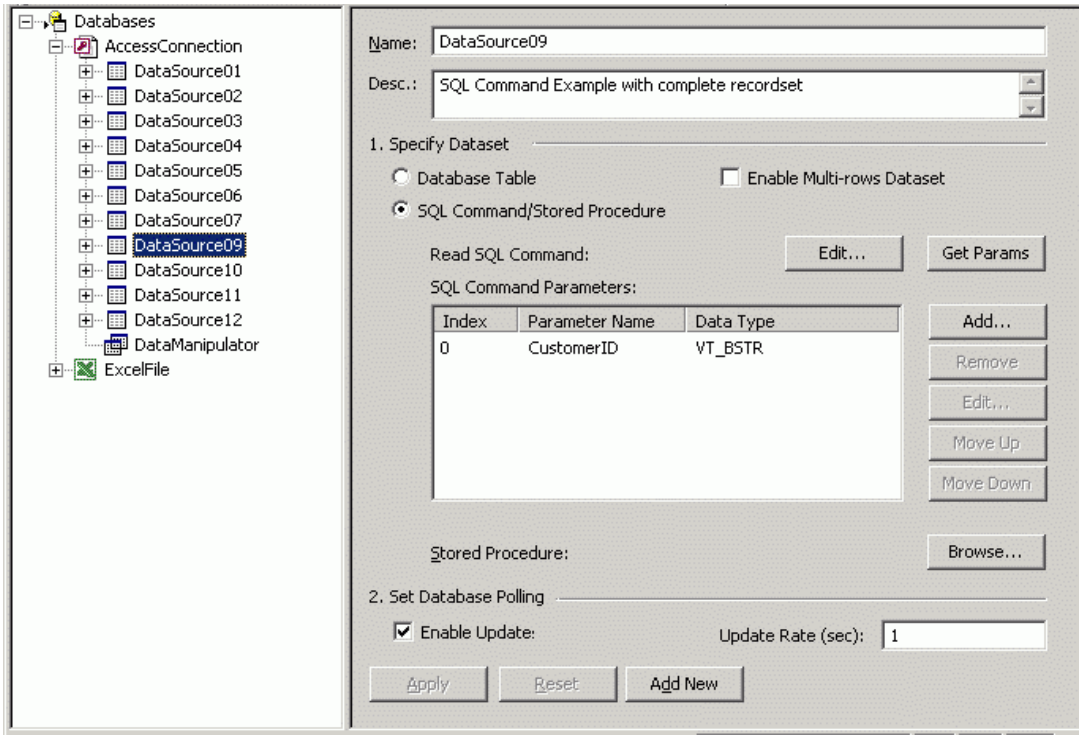
SQL Command

The **SQL Command** data source is designed to access database data using SQL commands based on SELECT statements. The SQL command can be parameterized by SQL command parameters. Parameters in a SQL command are represented by question marks (?) and they are filled in the same order as configured in **SQL Command Parameters** section of the configuration dialog.

Database stored procedures returning cursor variables (row sets) can be also accessed using a SQL command based on EXECUTE or CALL statements.

To enter a SQL command to read from the database:

1. Select the **SQL Command/Stored Procedure** option under the **Specify Data Set** section, as shown in the figure below.

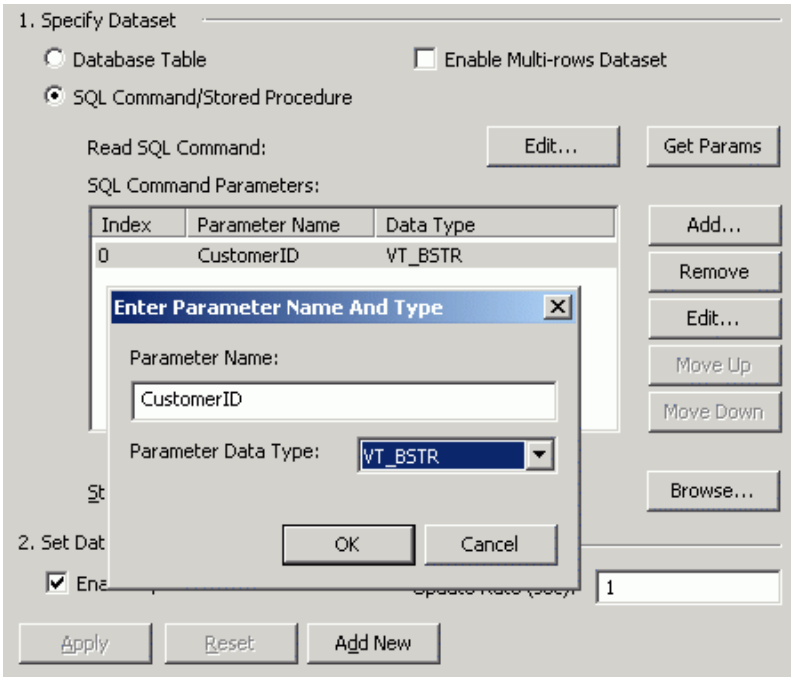


Data Source Properties: SQL Command

2. In the SQL Command Parameters field, click the Add button. Enter a Parameter Name (i.e. column name) and choose one of the following Parameter Data Types from the drop-down list, as shown in the figure below. Click OK.

NOTE
You can also click the Get Params button to select a parameter from the database.

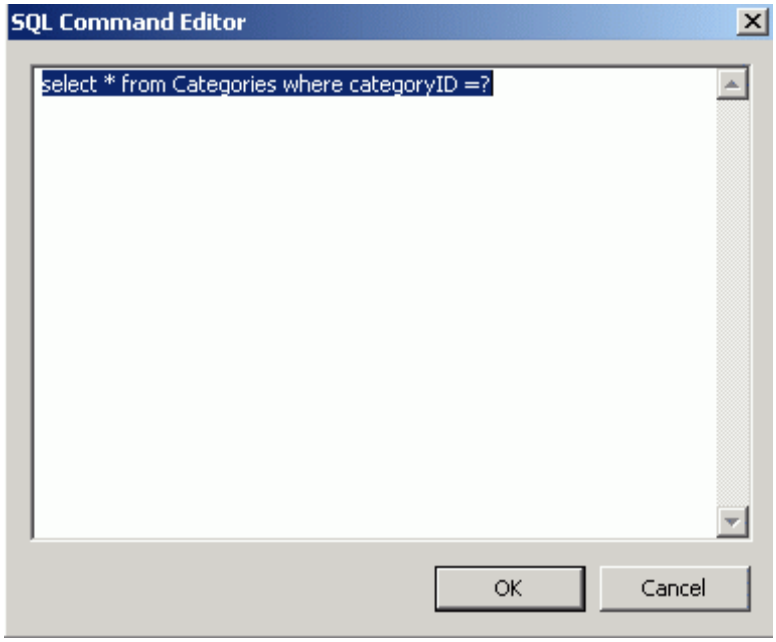
- **VT_I4:** 4-byte integer
- **VT_R8:** 8-byte floating-point number (double)
- **VT_DATE:** Date in OleDateTime format; the DATE type is implemented using an 8-byte floating-point number. Days are represented by whole number increments starting with 30 December 1899, midnight as time zero. Hour values are expressed as the absolute value of the fractional part of the number.
- **VT_BSTR:** String
- **VT_BOOL:** Boolean



Specifying SQL Parameter Name

3. To view or modify the SQL query, click the Edit button. This opens the SQL Command Editor, which enables you to manually edit the query string, as shown in the figure below. Click OK.

NOTE
If you want to read more than one row from the selected database table, check the **Enable Multi-rows Dataset** check box. This way you do not need to add individual rows to the **Table Parameters** field.



SQL Command Editor

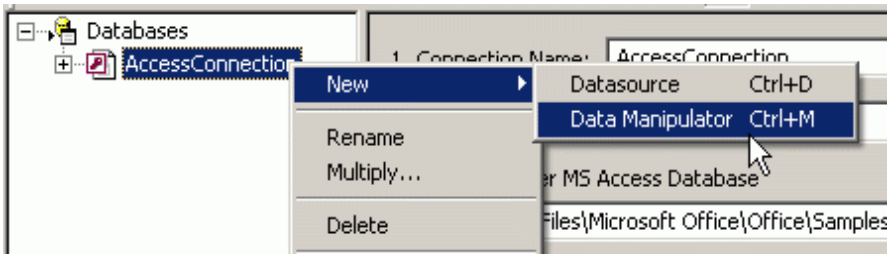
NOTE
You can also change the column ordering in the data source configuration by selecting a column and clicking the **Move Up** or **Move Down** buttons. Click the **Remove** button to delete the selected column(s).

Creating a New Data Manipulator

Data manipulators allow you to create and edit custom SQL queries as well as use stored procedures to modify data in a connected database.

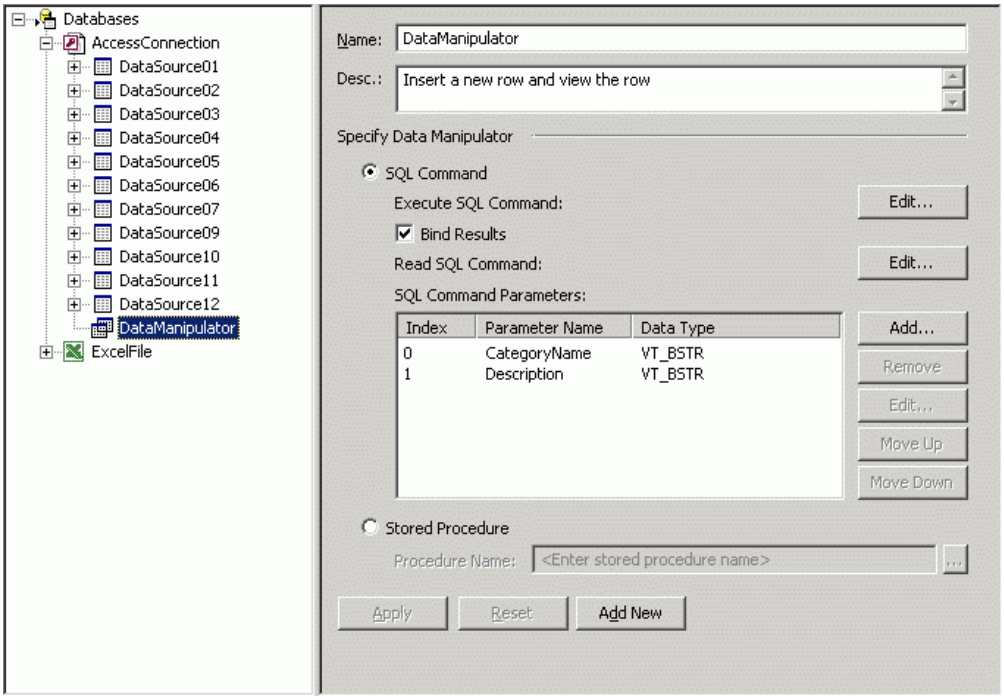
To create a new data manipulator:

1. Right-click on a database connection in the tree control of the Configurator and select **New > Data Manipulator** from the pop-up menu, as shown in the figure below.



Creating a New Data Manipulator

2. The properties dialog box for the new data manipulator appears in the right-hand pane of the Configurator, as shown in the figure below.



Setting the Properties for the New Data Manipulator

3. In the Name field, type a name for the new data manipulator.

4. Specify the type of data manipulator to use (SQL Command or Stored Procedure). If you use a SQL command, click the Edit buttons to create/edit your SQL queries. If you choose stored procedure, click the … button to select a stored procedure.

NOTE
SQL queries in a data manipulator object should be used only for databases that do not support stored procedures (e.g. Excel, MS Jet). In all other cases, stored procedures/functions should be used to manipulate database data. The reason for this is that stored procedures offer wider functionality, and because they are precompiled on the server, execution is much faster.

5. When you have finished configuring the data manipulator properties, click the Apply button. The new data manipulator appears under the database connection in the tree control.

Data Manipulator Properties

A **data manipulator**, which is intended for processing data stored in a connected database, manipulates data using a SQL *write* command or by executing a stored procedure. Configuring a data manipulator requires the following basic steps, as shown in the figures below:

1. In the Name field, type a name for the new data manipulator.
2. Specify the type of data manipulator to use (SQL Command or Stored Procedure). If you use a SQL command, click the Edit buttons to create/edit your SQL queries. If you choose stored procedure, click the … button to select a stored procedure.

NOTE
SQL queries in a data manipulator object should be used only for databases that do not support stored procedures (e.g. Excel, MS Jet). In all other cases, stored procedures/functions should be used to manipulate database data. The reason for this is that stored procedures offer wider functionality, and because they are precompiled on the server, execution is much faster.

3. When you have finished configuring the data manipulator properties, click the Apply button. The new data manipulator appears under the database connection in the tree control.

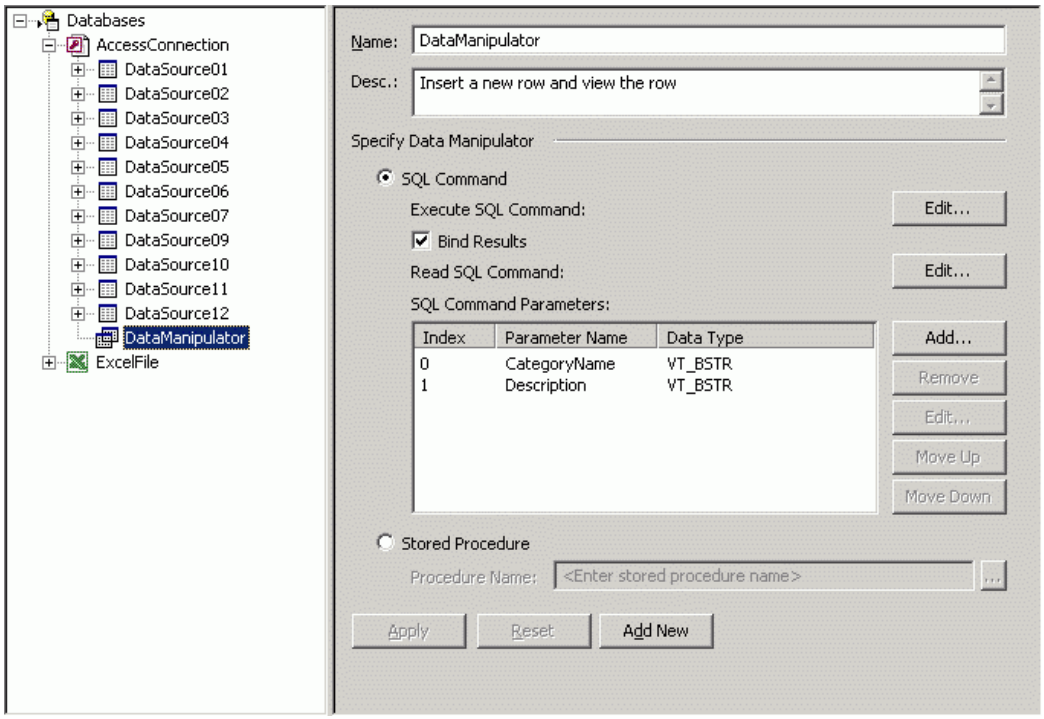
SQL Commands

The SQL command data manipulators are mainly designed for databases that don't support stored procedures (MS Excel, partly MS Access, etc.). It allows configuring two SQL commands – one for actual data manipulation action, the second for getting results (if needed). Setting the parameters is similar to SQL commands in the data source configuration. Result SQL command is using the same set of parameters as Execute SQL command in data manipulation action.

SQL queries/commands in a data manipulator object are mainly designed for databases that do not support stored procedures (e.g. Excel, MS Jet). You can configure two SQL commands: one for the actual data manipulation action; the second for getting results (if needed). Setting the parameters is similar to SQL commands in the data source configuration. The Result SQL command uses the same set of parameters as the Execute SQL command in a data manipulation action. In all other cases, stored procedures/functions should be used to manipulate database data. The reason for this is that stored procedures offer wider functionality; and because they are precompiled on the server, execution is much faster.

To enter a SQL command to read from the database:

1. Select the **SQL Command** option under the **Specify Data Manipulator** section, as shown in the figure below.

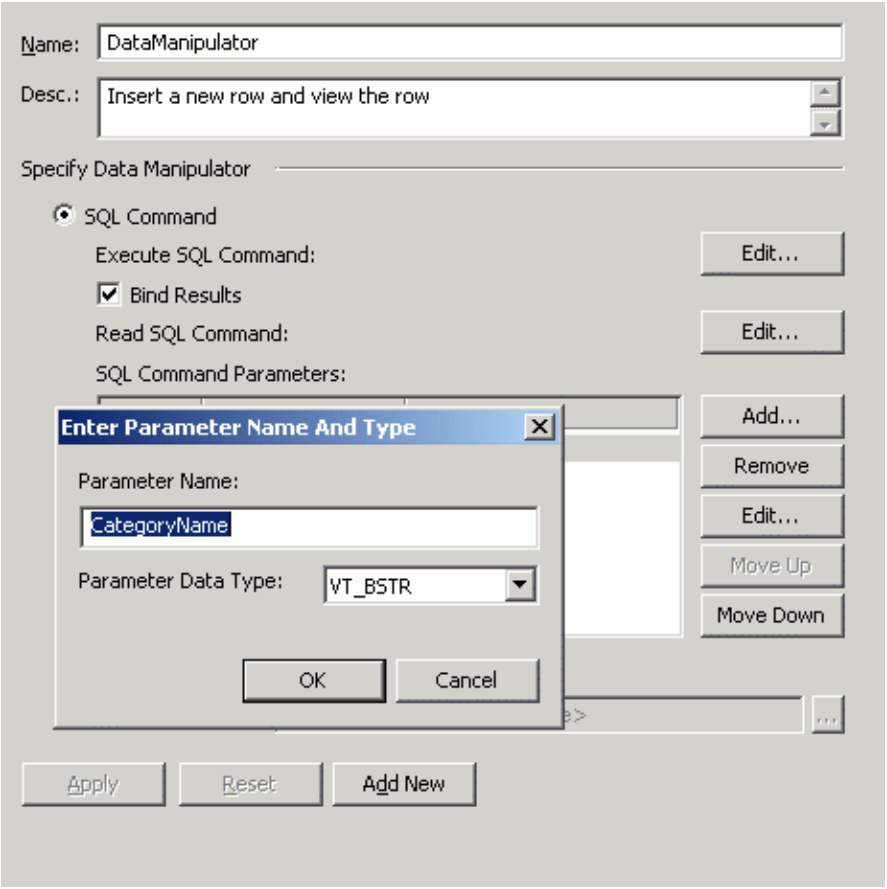


Data Manipulator Properties: SQL Command

2. In the **SQL Command Parameters** field, click the **Add** button. Enter a **Parameter Name** (i.e. column name) and choose one of the following **Parameter Data Types** from the drop-down list, as shown in the figure below. Click **OK.**

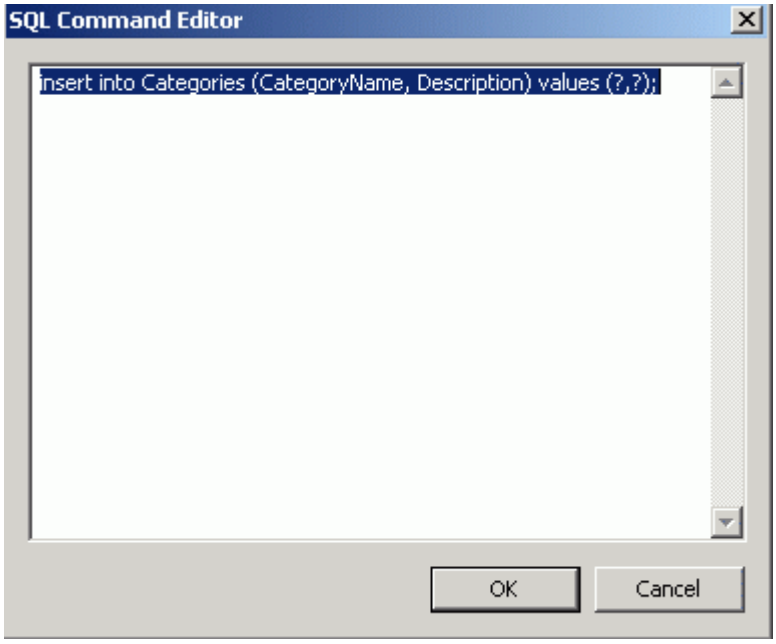
NOTE
If you have multiple values (parameters) you can bind them by checking the **Bind Results** check box.

- **VT_I4:** 4-byte integer
- **VT_R8:** 8-byte floating-point number (double)
- **VT_DATE:** Date in OleDateTime format; the DATE type is implemented using an 8-byte floating-point number. Days are represented by whole number increments starting with 30 December 1899, midnight as time zero. Hour values are expressed as the absolute value of the fractional part of the number.
- **VT_BSTR:** String
- **VT_BOOL:** Boolean



Specifying SQL Parameter Name

3. To view or modify the SQL query, click the **Edit** button. This opens the **SQL Command Editor, which** enables you to manually edit the query string, as shown in the figure below. Click **OK.**



SQL Command Editor

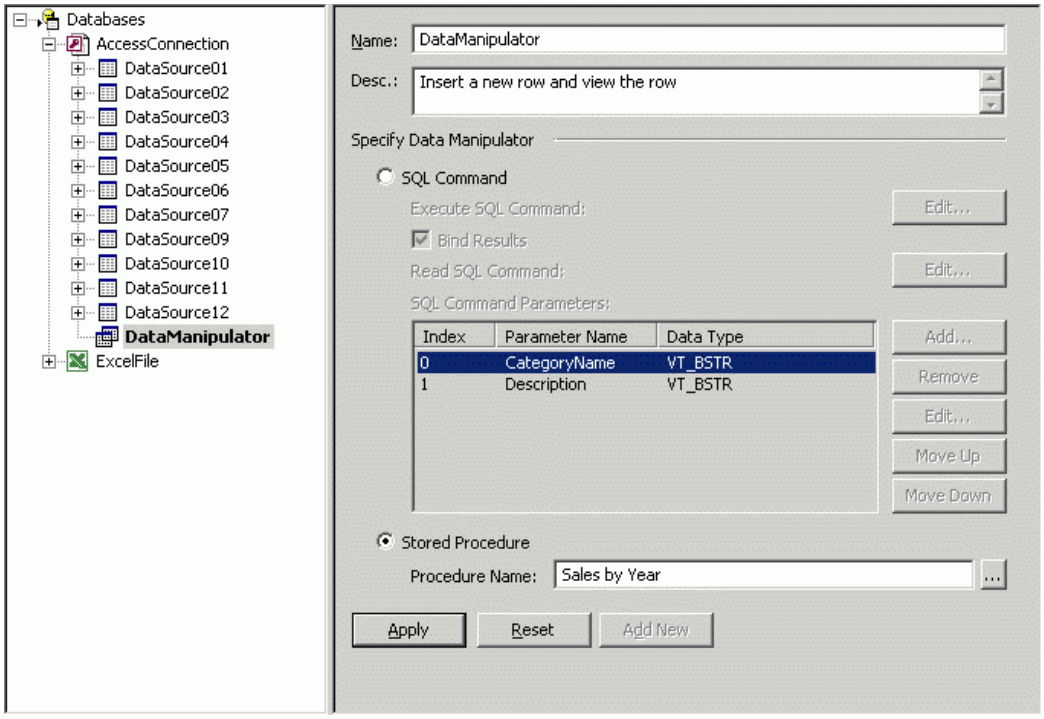
NOTE
You can also change the column ordering in the data source configuration by selecting a column and clicking the **Move Up** or **Move Down** buttons. Click the **Remove** button to delete the selected column(s).

Bind Results
When the **Bind Results** check box is checked, it executes "binding" of a SQL query in the same transaction and returns its rowset as output parameters. This allows you to read some database data immediately after executing a data manipulation SQL command (e.g. you can read the ID of a newly created record).

Stored Procedure

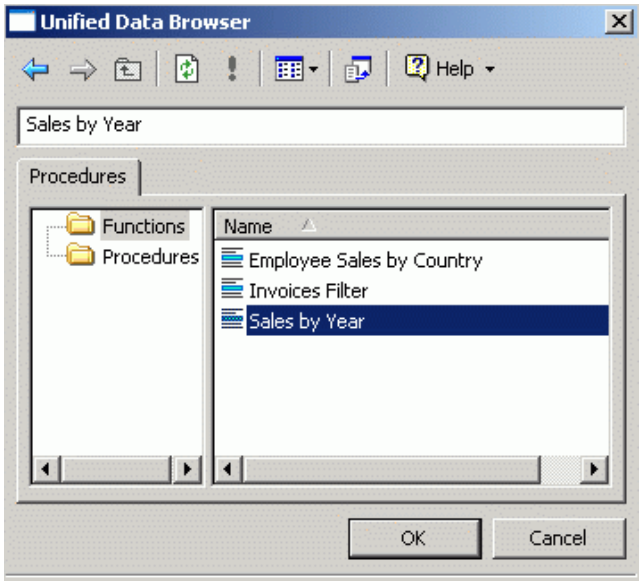
Stored procedures are the preferred way of using data manipulators. They are much more flexible than SQL commands and usually are faster in processing. Their wide range of capabilities allows for complex database data manipulation.
To get data from a stored procedure in the database:

1. Select the **Stored Procedure** option under the **Specify Data Manipulator** section, as shown in the figure below.



Data Manipulator Properties: Stored Procedure

2. In the Procedure Name field, click the … button. This opens the Unified Data Browser, which lists all the stored procedures in the database, as shown in the figure below. Select a procedure (e.g. "Sales by Year"), and then click OK.



Selecting a Stored Procedure

Data Items

Once you have selected a data set or data manipulator to mine within the connected database, the next step is to specify which data items to monitor within the chosen data set (i.e. which values to read from the selected group of data). A data item represents a single value in a data set. There are two general types of data items:

- Data items for data sources
- Data items for data manipulators

Data Items for Data Sources

Two types of data items are used for data sources:

- Statically defined (preconfigured)
- Dynamically requested (parameter values are set in runtime)

NOTE
Data items are also accessible as OPC Data Access tags; i.e. they are visible in OPC DA browsers as ordinary OPC DA tags. The ProgID of the Data Mining server is SMAR.DatabaseOPCServer.3.

Static Data Items

Static data items must be preconfigured and cannot be changed in runtime mode. Basically there are used two types of static data items:

- Column-oriented data item: Gets value(s) from the table column specified in the configuration
- Record-set oriented data item: Gets the whole table row(s) as an array of VARIANT values (single or multi-dimensional array).

Dynamic Data Items

Dynamic data items are available under every data source object without being configured. The syntax of a fully qualified OPC DA tag ID is as follows:
SMAR.DatabaseOPCServer.3\DataSourceName<ParameterValues>.DataItemName
where

- DataSourceName is the name of the data source object in the server configuration.

- ParameterValues are values for data source parameters delimited with semicolons (see the tables below).
- DataItemName can be one of "<Column Name>", "@@Recordset", "@@Refresh", "@@LastScanTime" (see the tables below).

DATA TYPE	DESCRIPTION	VALUE SYNTAX
String (VT_BSTR)	String	"text"
Integer (VT_I4)	4-bytes integer	123
Real (VT_R8)	8-bytes floating-point number (double)	3.14 or -1.82E-3
Boolean (VT_BOOL)	Boolean	BOOL (True) or BOOL (False)
VT_DATE	8-byte floating-point number	DATETIME(date value)

NOTE
The DATE type is implemented using double-precision numbers. Days are represented by whole number increments starting with 30 December 1899, midnight as time zero. Hour values are expressed as the absolute value of the fractional part of the number.

DATA ITEM NAME	ACCESS RIGHTS	DESCRIPTION
@@Column	Read/Write	Can address the only one table column identified by its name placed into the last section of OPC DA tag name; delimited by <>.
@@Recordset	Read/Write	Addresses the whole table row.
@@Refresh	Write	Any write forces the data source to re-read data from connected data source.
@@LastScanTime	Read	Returns time of the last data source update.

Dynamic data items can be indexed by parameters configured at the data source level. It allows changing parameter values dynamically in runtime, e.g. using aliases, variables or scripting.

Note: Alias names should have quotation marks around them. If you are using aliases, the aliases and quotes should use the following syntax:
<"<<Alias1>>";"<<Alias2>>";"<<Alias3>>">

Examples

Suppose you have a database table "Sample" with columns "PID," "Name," "Description" and data source with name "Sample_by_PID," referring to this table with one parameter "PID." The table does not contain any rows with PID greater than 5.

1. The OPC DA tag "SMAR.DatabaseOPCServer.3\Sample_by_PID<1>.<Name>" accesses the "Name" column for row with PID = 1.
2. The OPC DA tag SMAR.DatabaseOPCServer.3\Sample_by_PID<1>.@@Recordset" accesses the whole table row with PID = 1. Table row(s) values are returned in array of VARIANT values (one or two dimensional - depends on data source configuration).
3. Inserts into column-oriented data item configured to access table column "Name" with PID set 10:Writing string "John" into this data item will create a new table row with the following values: PID = 10, Name = "John," Description = database default value.
4. Inserts into record set oriented OPC tag with PID set 11:Writing array of VARIANTs will create a new table row using all values from passed array (overrides database default values and parameter values).
5. Deletes table row with PID = 11:

Writing VT_EMPTY value into data item used in previous example will delete row with PID = 11.

Data Items for Data Manipulators

There are two types of data items that can access data manipulator objects:

- Execute data item
- Result data item

The data manipulator object executes its action asynchronously; unique request identification is needed to pair requests and responses, as shown in the table below.

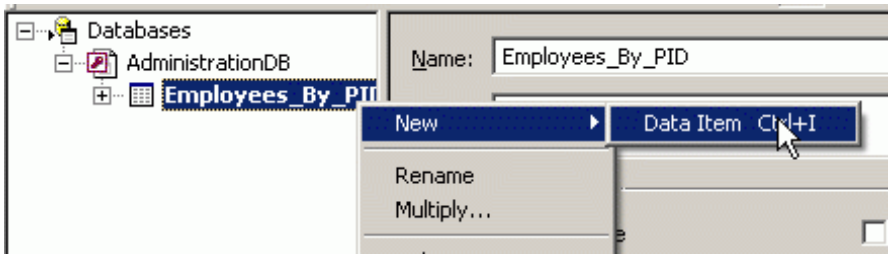
NOTE
ProcessView includes two components for accessing data manipulator objects synchronously: DBOPCManipulatorWrapper and the Data Manipulator ActiveX control.

DATA ITEM NAME	ACCESS RIGHTS	DESCRIPTION
@@Execute	Write	Writing to this data item executes a data manipulator action (stored procedure or SQL command). The actual value written to this tag must conform to the following rules: It must be an arrary of VARIANTs. The first value in this array is the unique request identification. The rest of the values are used as input parameters for data manipulator.
@@Result	Read	Returned values represent responses for execute requests. All the returned values are stored in an array of VARIANTs. Similar to the @@**Execute** data item, the first value in this array is the unique request identification used in execute data item. The rest of the values are output parameters (if there are any).

Creating a New Data Item

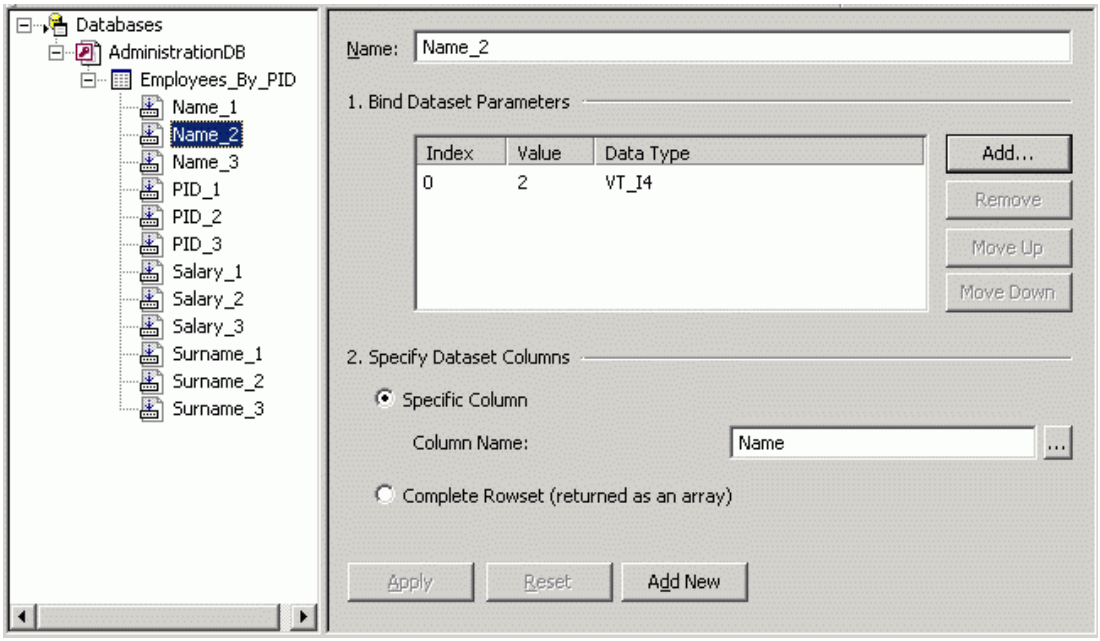
To create a new data item:

1. Right-click on a data source in the tree control of the Configurator and select **New > Data Item** from the pop-up menu, as shown in the figure below.



Creating a New Data Item

2. The properties dialog box for the new data item appears in the right-hand pane of the Configurator, as shown in the figure below.



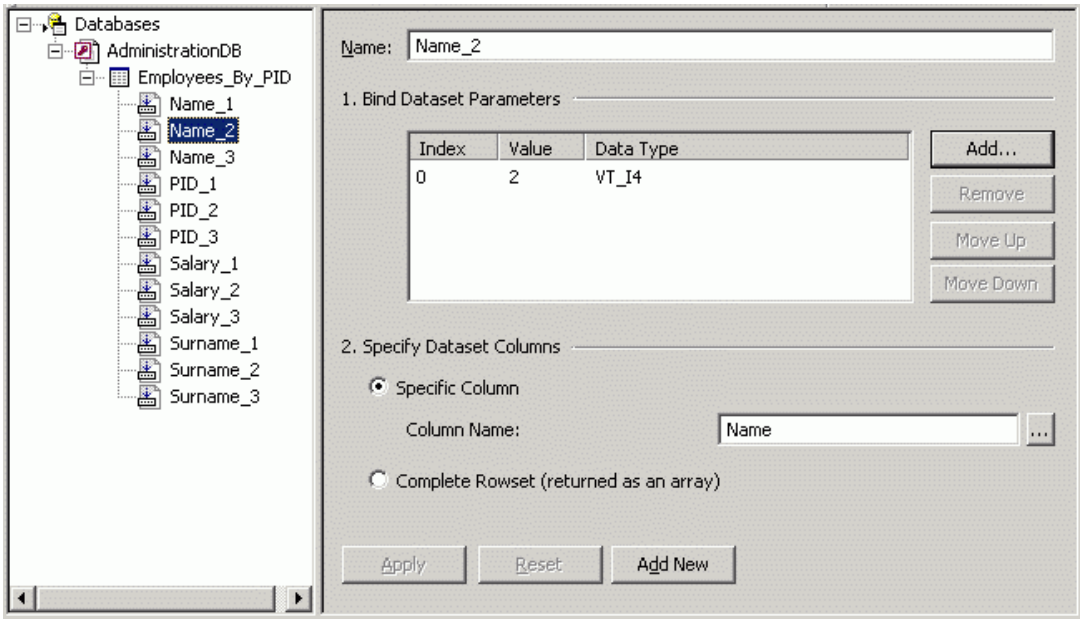
Setting the Properties for the New Data Item

3. In the Name field, type a name for the new data item.
4. Click the Add button to enter data set parameter values.
5. Select the data set columns (table) for the data item. You can select a Specific Column, or use a Complete Rowset.
6. When you have finished configuring the data item properties, click the Apply button. The new data item appears under the data source in the tree control.

Data Item Properties

Configuring a data source requires the following basic steps, as shown in the figure below:

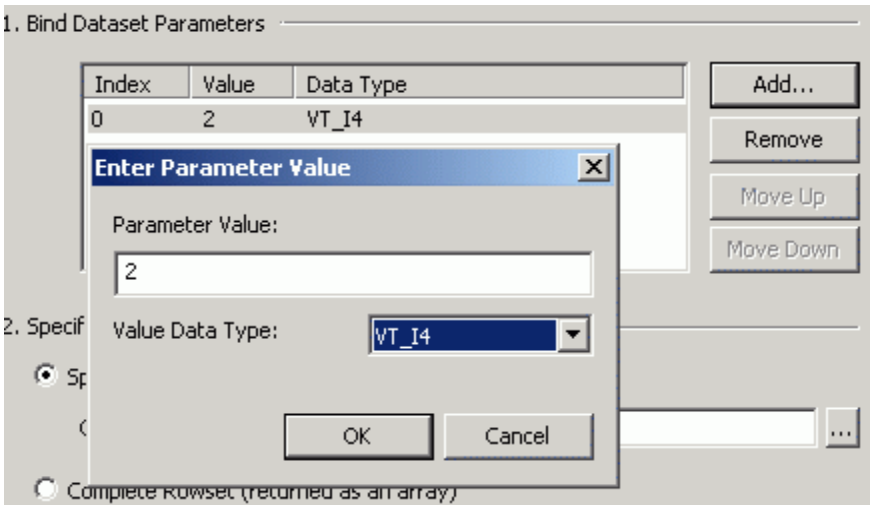
1. In the Name field, type a name for the new data item.



Data Item Properties

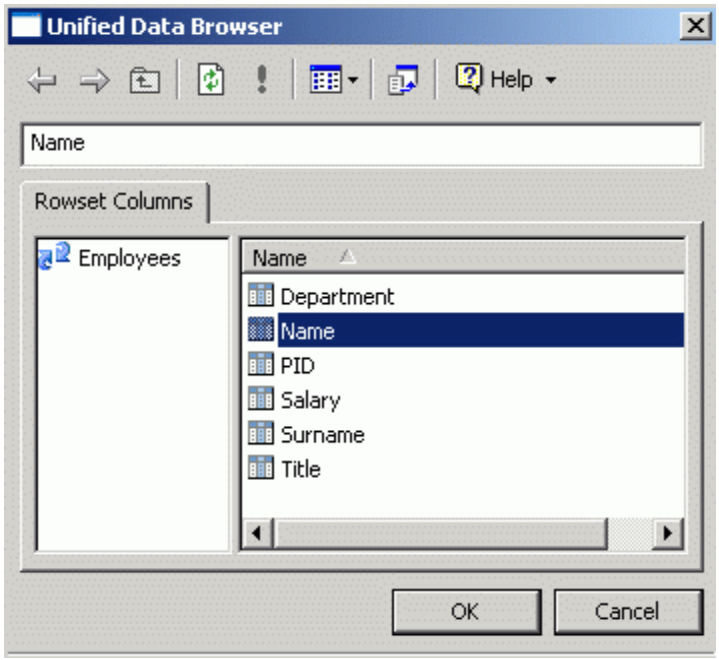
1. In the **Bind Data Set Parameters** field, click the **Add** button to enter data set parameter values, as shown in the figure below. Enter a **Parameter Value** (i.e. column name) and choose one of the following **Value Data Types** from the drop-down list.

- **VT_I4:** 4-byte integer
- **VT_R8:** 8-byte floating-point number (double)
- **VT_DATE:** Date in OleDateTime format; the DATE type is implemented using an 8-byte floating-point number. Days are represented by whole number increments starting with 30 December 1899, midnight as time zero. Hour values are expressed as the absolute value of the fractional part of the number.
- **VT_BSTR:** String
- **VT_BOOL:** Boolean



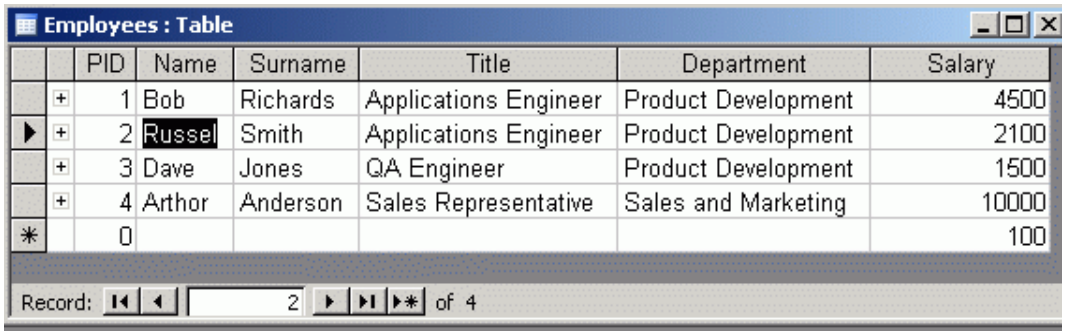
Entering Parameter Value for Data Item

2. Select the data set columns (table) for the data item. You can select a Specific Column, or use a Complete Rowset. To choose a specific column, click the … button and browse for a column name (e.g. "Name") from the list of columns in the database table, as shown in the figure below.



Specifying Column Name in Data Item

3. The Parameter Value corresponds to the record number in the database table. For data item Name_2, the Parameter Value is "2," as shown in the figure above. As you can see in the figure below, in the Name column, record number "2" corresponds to the second value in the column. Thus, the value for record number "2" is Russel, which is highlighted in the figure below. Thus, the Parameter Value for data item Name_2 is resolved as "Russel."



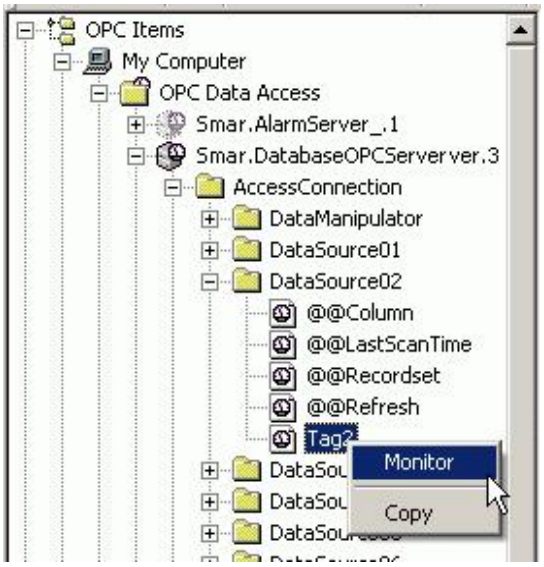
Record Number in Database Table

4. When you have finished configuring the data item properties, click the Apply button. The new data item appears under the data source in the tree control.

Testing Your Data Tags

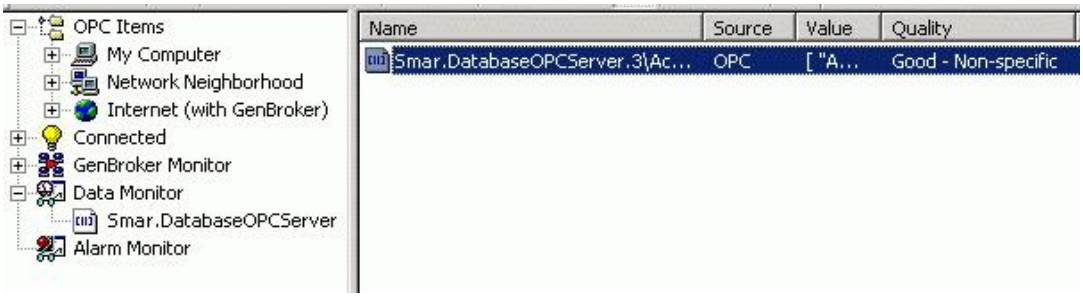
Before you try to connect to data sources and view your data tags, it is highly recommended that you verify if the tags present inside the display are well configured from the server side. To do that you have to check the quality of your data tags using OPC DataSpy:

1. Start OPC DataSpy from the Windows **Start** menu by selecting **Programs > Smar ProcessView > OPC DataSpy.**
2. In OPC DataSpy, expand the tree control and browse to your data tag. Right-click on the data tag(s) and select **Monitor** from the pop-up menu, as shown in the figure below.



Browsing for Data Tags in OPC DataSpy

3. The data tag(s) now appear in under the Data Monitor tree control, as shown in the figure below. The tag quality is indicated in the right-hand pane. If the tag quality is good, then the tag is ready for data mining. If the tag quality is bad, go back to the Data Mining Configurator and check your data source and data item configurations.



Data Tag Quality Indicated in DataSpy Data Monitor

Visualizing Data in GraphWorX

Once you have configured and tested your database connection, data sources, and data items in the Data Mining Configurator, the next step is to visualize the data in GraphWorX. You also can view data in the Data Mining ActiveX, which displays one-dimensional and multidimensional arrays of data from database connections inside a grid display, which is embedded in an ActiveX container. For more information, please see the Data Mining ActiveX help documentation.
The Data Mining Demo provides an example GraphWorX display that shows how to configure your data mining connections so you can view data coming from the database.

1. Go to the **C:\Program Files\Smar\Processview\Examples\Database Mining Examples** directory in the PROCESSVIEW installation and open the **DBOPC.gdf** file.

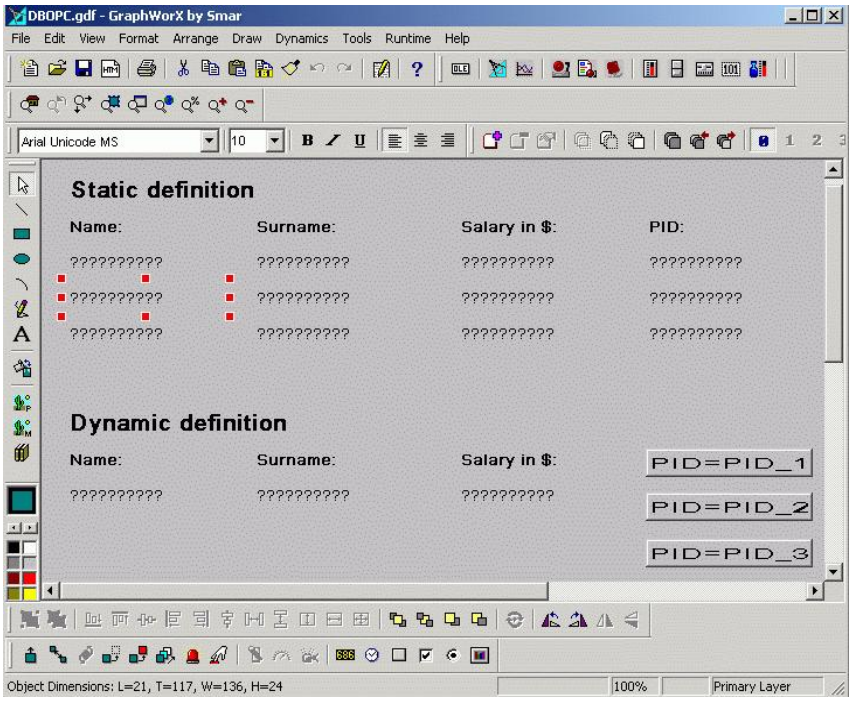
2. The display opens in GraphWorX configuration mode, as shown in the figure below. The display contains two different examples of data mining visualization: static and dynamic. A **static** display simply displays the data values from the connected database. A **dynamic** display allows you to manipulate data values from the connected database.

The table in the **static definition** section contains some column names from the **Employees** database table, as shown in the figure below:

- **Name:** Employee's first name
- **Surname:** Employee's last name
- **Salary:** Employee's salary
- **PID:** Employee's identification number

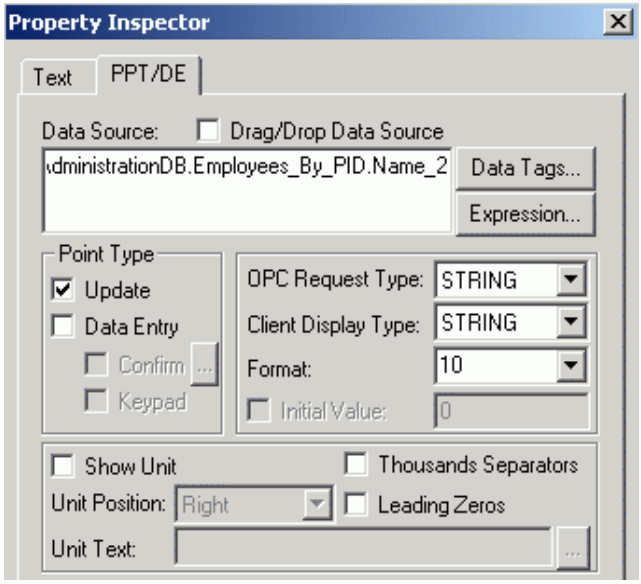
Each column contains process points that correspond to data items (e.g. **Name_1, Name_2, Name_3, PID_1, PID_2,** etc.) in the **Employees_By_PID** data source from the demo data mining configuration. A process point must be configured for each data item. We will continue to look at the **Name_2** data item as an example:

Under the **Name** column in the GraphWorX display, double-click the second process point under the **Name** column, as shown in the figure below.



Data Mining Demo in GraphWorX: Configuration Mode

3. This opens the **Property Inspector** for the data item. Click on the **PPT/DE** tab, as shown in the figure below. As you can see, the **AdministrationDB.Employees_By_PID.Name_2** item ID has already been specified in the **Data Source** field.

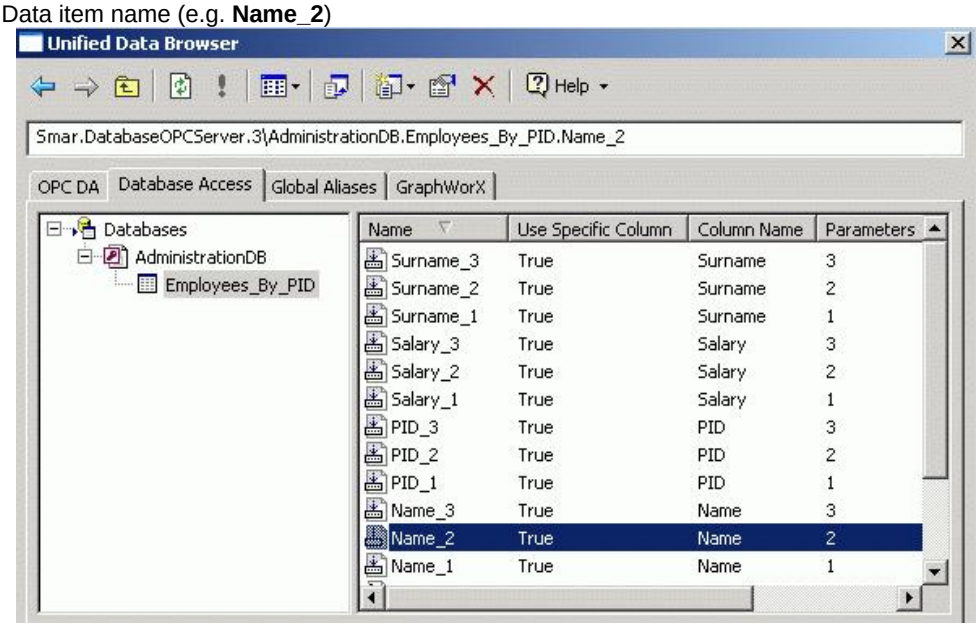


Property Inspector for Name_2 Data Item

4. Click on the **Data Tags** button to open the Unified Data Browser. The Unified Data Browser opens to the **Database Access** tab, as shown in the figure below. You can see that the browser tree control is similar to the tree control in the Data Mining Configurator; you can choose from configured data items from the **Employees_By_PID** data source connection. The **Name_2** item ID has already been selected. Notice that each **ItemID** (e.g. **SMAR.DatabaseOPCServer.3\AdministrationDB.Employees_By_PID.Name_2**) contains the following information:

- Server name (e.g. **SMAR.DatabaseOPCServer.3**)
- Database connection name (e.g. **AdministrationDB**)
- Data source name (e.g. **Employees_By_PID**)

- Data item name (e.g. **Name_2**)

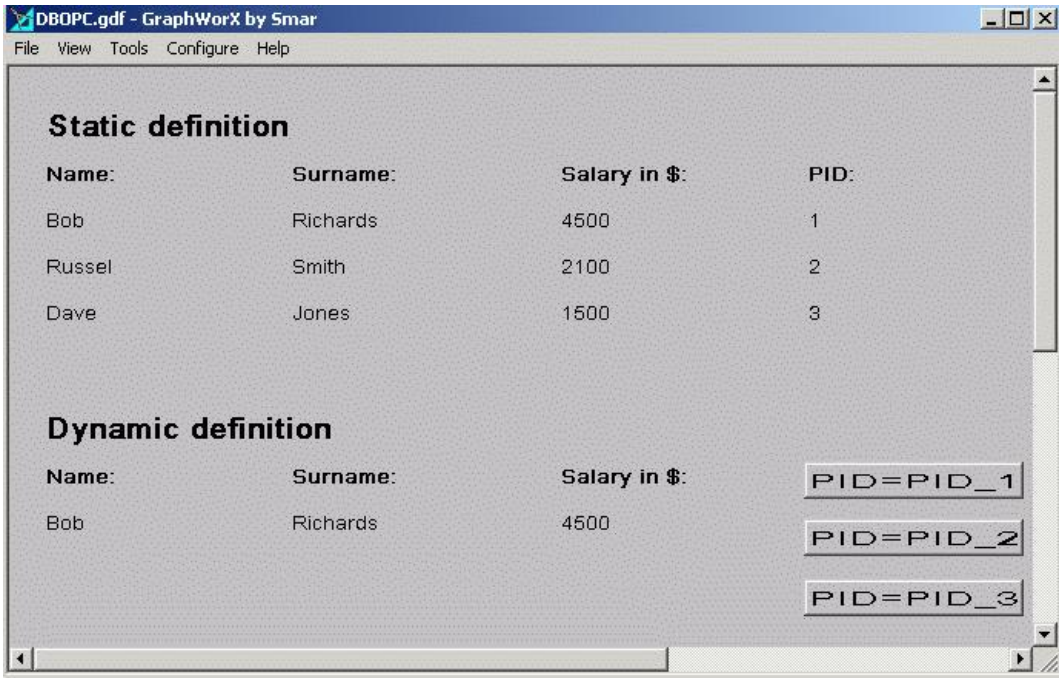


Data Item Specified in Unified Browser

5. Close out of the Unified data Browser and the Property Inspector dialog box.

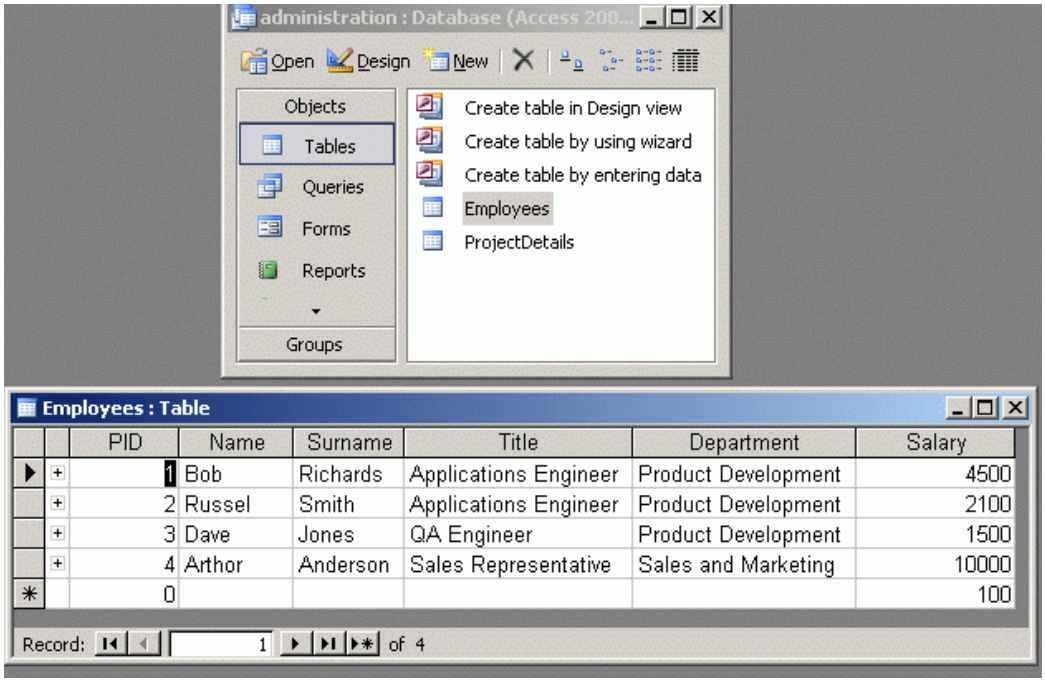
6. Enter the GraphWorX display into runtime mode. You can see the data coming from the **Employee** database table, as shown in the figure below. Notice that the **Parameter Value** for data item **Name_2** is resolved as "Russel" in the visualization display.

NOTE
The **Static definition** section simply displays the values from the **Employee** database table for the configured data items, but the data cannot be manipulated. The **Dynamic definition** section also displays values from the **Employee** database table, but in this case only one row of data is displayed at a time, and you change the currently viewed row by clicking the three PID buttons, as shown in the figure below. The dynamic configuration uses local aliases and global aliases, which enable you to switch between rows during runtime mode.



Data Mining Demo in GraphWorX: Runtime Mode

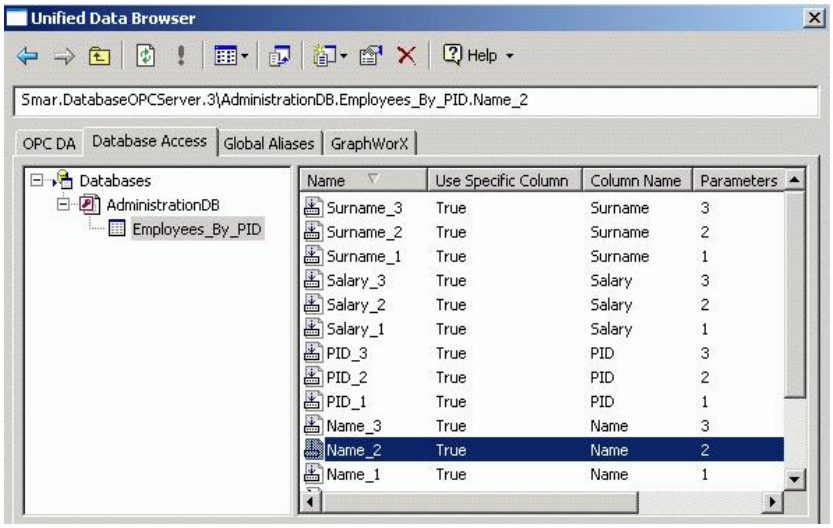
7. The items displayed in GraphWorX correspond to the information in the Employees database table in the Administration database. For example, the itemID AdministrationDB.Employees_By_PID.Name_2 has the value Russel, because Russel is the second name listed in the database table, as shown in the figure below.



Employees Table in Administration Database

Database Access Tag Syntax

In the **Database Access** tab of the Unified Data Browser, shown in the figure below, the tree control is similar to the tree control in the Data Mining Configurator; you can choose from configured data items from the **Employees_By_PID** data source connection.



Unified Browser: Browsing Databases

For example, in the figure above the **Name_2** item ID has been selected. The full **ItemID** is: **SMAR.DatabaseOPCServer.3\AdministrationDB.Employees_By_PID.Name_2**)
Each item ID in the **Database Access** tab contains the following information:

- Server name (e.g. **SMAR.DatabaseOPCServer.3**)
- Database connection name (e.g. **AdministrationDB**)
- Data source name (e.g. **Employees_By_PID**)
- Data item name (e.g. **Name_2**)

Data Mining Examples

The ProcessView installation includes several data mining example files in the **\Program Files\Smar\ProcessView\Examples\Database Mining Examples** directory.

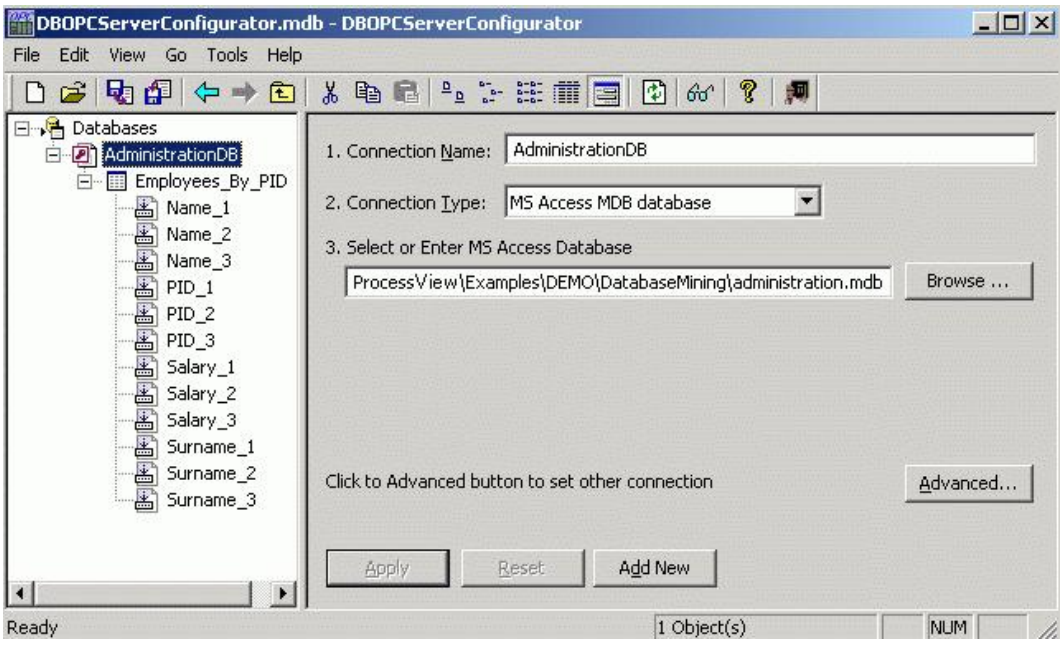
Example 1: Data Mining Configuration Demo

The ProcessView installation provides a default **Data Mining Demo** configuration. To view the demo files, go to the **C:\Program Files\SMAR\PROCESSVIEW-\Examples\Database Mining Examples** directory in the ProcessView installation. This directory contains the following files:

- **DBOPCServerConfigurator.mdb:** This Microsoft Access file is the default active data mining configuration database.
- **administration.mdb: This Microsoft Access file is the demo database connection.**
- **DBOPC.gdf: This is a GraphWorX display that allows you to view the data sources** and data items specified in the demo database connection.

To view the **DBOPCServerConfigurator.mdb** demo configuration database:

- Open the Data Mining Configurator from the Windows Start menu by selecting **Programs > Smar ProcessView > Tools > Data Mining Configurator**.
- This opens the DBOPCServerConfigurator.mdb database in the Configurator, as shown in the figure below. The main tree control of the Configurator is called Databases. Under this tree control, you can see the following items:
- The demo database connection, called AdministrationDB, which connects to the administration.mdb Microsoft Access database.
- A demo data source, called Employees_By_PID.
- Several data items (e.g. Name_1, Name_2, Name_3, PID_1, PID_2, etc.)
- These demo items are described in greater detail in the Data Mining Configurator Help documentation.



Data Mining Configuration Demo

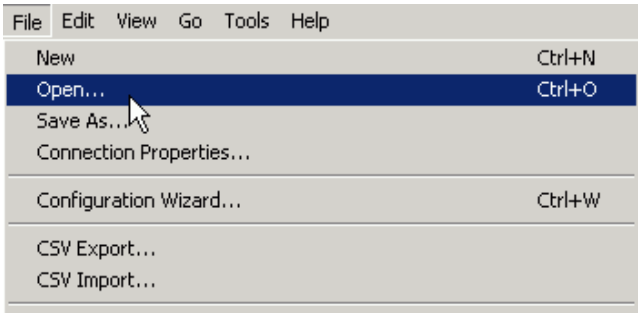
Example 2: Data Source Configuration Examples

The second data mining example provides a data mining configuration database with several different types of preconfigured data sources. For this example, the PROCESSVIEW installation includes the following data mining example files in the **\Program Files\SMAR\PROCESSVIEW-**\Examples\Database Mining Examples directory:

- **DBOPCServerExample.mdb:** This is an example data mining configuration database that contains many example data sources and data tags.
- **Northwind.mdb:** This is an example Microsoft Access database to which the example data mining configuration database is connected.
- **DBOPC_PainReliefRECIPE.XLS:** This is an example Microsoft Excel workbook to which the example data mining configuration database is connected.
- **DBOPC_GlobalAliasCfg.mdb:** This is a global aliasing configuration database that is used with the Excel data source example. In order to use the Excel example, you must open this database in the Global Aliasing Configurator and activate the database by selecting **Make Active** from the **File** menu.
- **DBOPC_Excel.gdf:** This GraphWorX display allows you to view and write to Excel cells that are included in the **DBOPC_PainReliefRECIPE.XLS** spreadsheet. In order to use the Excel example, you must open the **DBOPC_GlobalAliasCfg.mdb** database in the Global Aliasing Configurator and activate the database by selecting **Make Active** from the **File** menu.
- **DBOPC_Access1.gdf:** This GraphWorX display contains single-value database tags, extended syntax tags, and writeable tags.
- **DBOPC_Access2.gdf:** This GraphWorX display contains tags that return a single-dimensional recordset connecting to a database table in the Data Mining ActiveX.
- **DBOPC_Access3.gdf:** This GraphWorX display contains tags that return a two-dimensional recordset connecting to a database table in the Data Mining ActiveX.
- **DBOPC_Access4.gdf:** This GraphWorX display contains tags that return a single-dimensional recordset connecting to a database table using a SQL command in the Data Mining ActiveX.
- **DBOPC_Access5.gdf:** This GraphWorX display contains tags that return a two-dimensional recordset connecting to a database table using a SQL command in the Data Mining ActiveX.
- **DBOPC_GlobalAlias.gdf:** This GraphWorX display contains an example of how to use global aliases as tags in the Data Mining ActiveX.

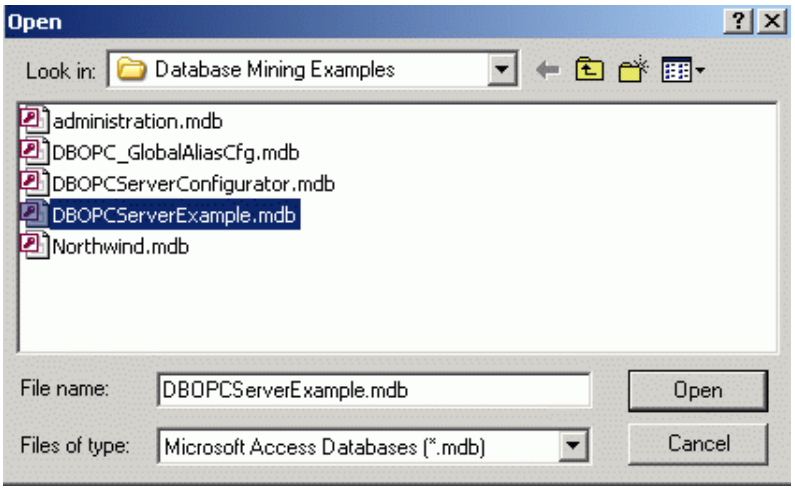
To view the example configuration database:

1. Open the Data Mining Configurator from the Windows **Start** menu by selecting **Programs > SMAR PROCESSVIEW > Tools > Data Mining Configurator.**
2. Select **Open** from the **File** menu, as shown in the figure below.



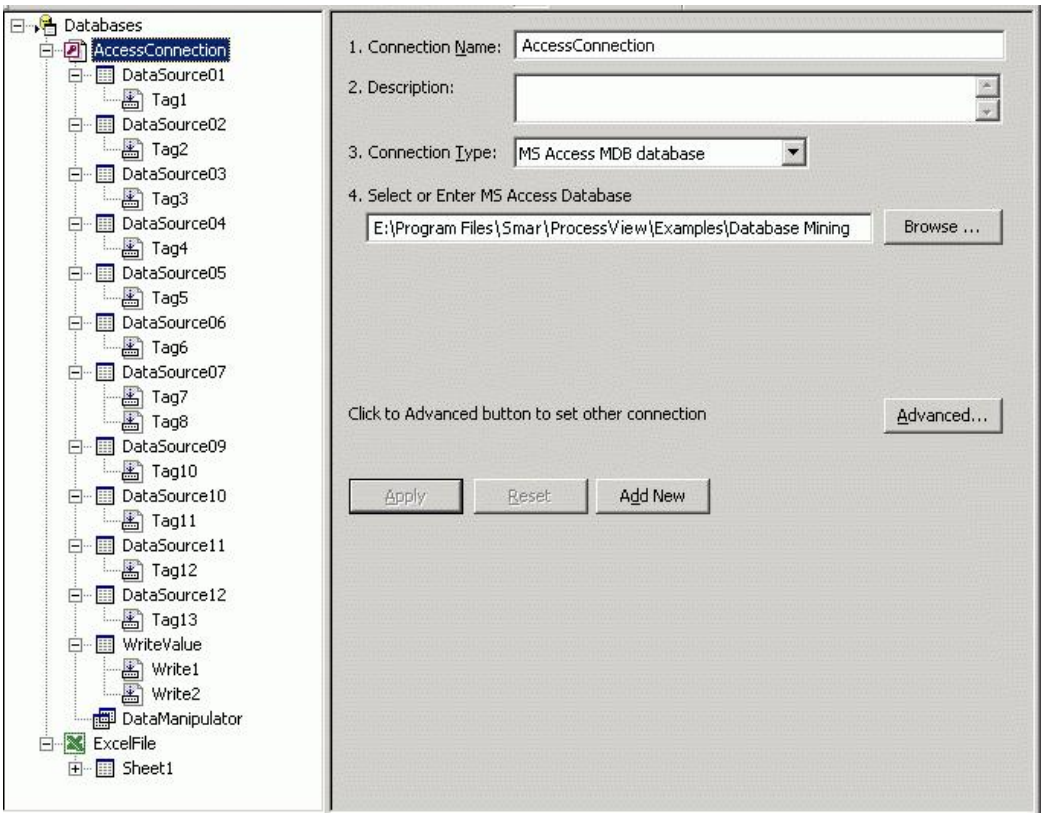
Opening the Example Configuration

3. Browse to the Program Files\SMAR\PROCESSVIEW-\Examples\Database Mining Examples directory and select the DBOPCServerExample.mdb file, as shown in the figure below.



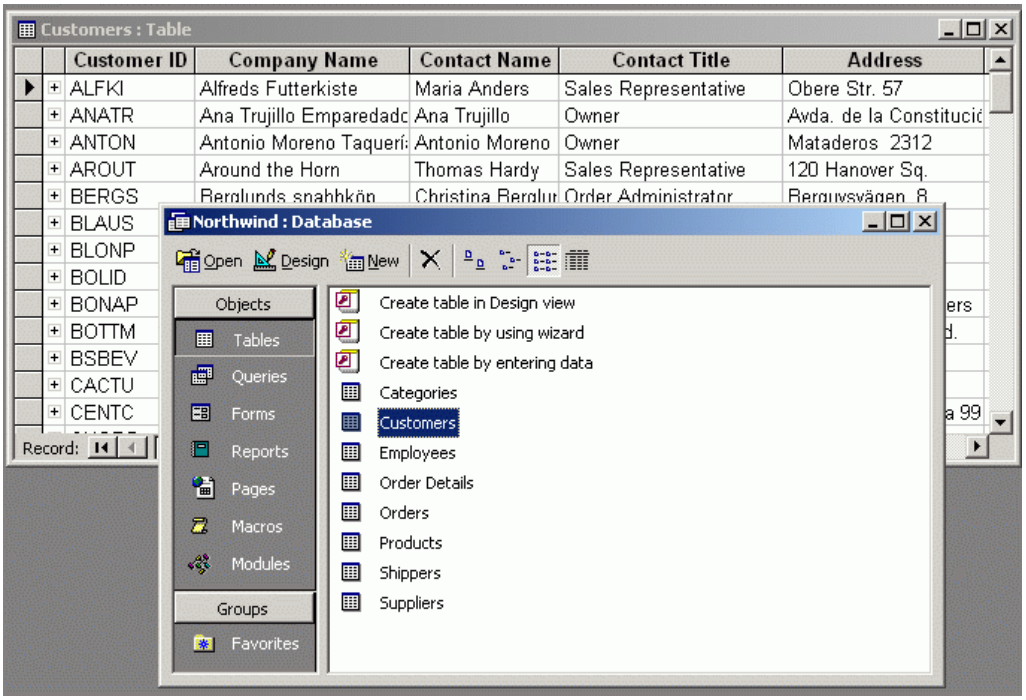
Selecting the Data Mining Example Configuration Database

4. The example data mining configuration opens in the Configurator, as shown in the figure below. The example configuration contains two different database connections. These connections contain several data sources and data items (tags).



Data Mining Example Configuration Database

The first is a connection to the Northwind.mdb Microsoft Access database, as shown in the figure below. This database connection reads data from reads data from the Customers table in the Northwind database. The figure below shows this table as viewed in Microsoft Access. As you can see, it has several columns of data (e.g. Customer ID, Company Name, Contact Name, Contact Title, etc.).



Customers Table in Northwind Database.

The example configuration database contains the following data sources and data tags:

- **DataSource01.Tag1:** Reads a single value from the CompanyName column in the Customers table.
- **DataSource02.Tag2:** Reads a complete rowset from the Customer ID column in the Customers table.
- **DataSource03.Tag3:** Reads all values from the Company Name column in the Customers table.
- **DataSource04.Tag4:** Reads all values from the Customers table in a multidimensional array.
- **DataSource05.Tag5:** Reads a complete rowset from the Customer ID column in the Customers table.
- **DataSource06.Tag6:** Reads a single value from a list list of parameters.
- **DataSource07.Tag7:** Reads a single value from the CompanyName column in the Customers table.
- **DataSource07.Tag8:** See single value. Reads a single value from the CompanyName column in the Customers table.
- **DataSource09.Tag10:** SQL command reads a complete rowset from the Customer ID column in the Customers table.
- **DataSource10.Tag11:** SQL command reads a single value from the CompanyName column in the Customers table.
- **DataSource11.Tag12:** SQL command reads all values from the Customers table in a multidimensional array.
- **DataSource12.Tag13:** SQL Command Example reads multiple rows from the ContactName column in the Customers table.
- **WriteValue.Write1:** Writes values to these tags from GraphWorX and displays the changes online.
- **WriteValue.Write2:** Writes values to these tags from GraphWorX and displays the changes online.

It is recommended that you view these data tags in the Data Mining ActiveX in GraphWorX so you can see how the data are displayed in the Grid ActiveX when connections to data tags are established for both one-dimensional and multidimensional arrays. For more information, please see the Data Mining ActiveX help documentation.

Example 3: Data Mining Logging Examples

The third data mining example provides a data mining logging configuration that connects to different data sources using the Data Mining ActiveX control and Data Manipulator ActiveX control.

For this example, the PROCESSVIEW installation includes the following data mining example files in the **\Program Files\SMAR\PROCESSVIEW-\Examples\Database Mining Examples** directory:

- **DataLoggerExample.gdf:** This is a GraphWorX example display that contains Data Mining ActiveX controls and Data Manipulator ActiveX controls.
- **DBOPCServerDBGridExample.mdb:** This is an example data mining configuration database that contains some preconfigured example data sources and data manipulators that are used in the logging example.
- **DataLogger.mdb:** This is a logger database that is used by the Data Mining ActiveX controls and two Data Mining Manipulator ActiveX controls in the **DataLoggerExample.gdf** display.

For more information about this example, please see the Data Manipulator Example application note on the PROCESSVIEW product CD.